# Thesaurus of Scales and Melodic Patterns

Nicolas Slonimsky

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# INTRODUCTION

THE PRESENT THESAURUS is a reference book of scales and melodic patterns, analogous in function with phrase books and dictionaries of idiomatic expressions. But while phrase books are limited to locutions consecrated by usage, the THESAURUS includes a great number of melodically plausible patterns that are new. In fact, many compositions appearing in recent years contain thematic figures identical with those found in the THESAURUS.

From time to time musical theorists have suggested the possibility of forming entirely new scales based on the division of the octave into several equal parts. As early as 1911 the Italian musician Domenico Alaleona proposed such new scales. Alois Haba, in his *Neue Harmonielehre* (1927), classifies a great number of scales based on equal intervals and suggests harmonizations of these new scales. Joseph Schillinger in his posthumously published *Schillinger System of Musical Composition* classifies new tonal progressions in the chapter Theory of Pitch-Scales.

The scales and melodic patterns in the THESAURUS are systematized in a manner convenient to composers in search of new materials. The title THESAURUS OF SCALES AND MELODIC PATTERNS is chosen advisedly. The term scale, as here used, means a progression, either diatonic or chromatic, that proceeds uniformly in one direction, ascending or descending, until the terminal point is reached. A melodic pattern, on the other hand, may be formed by any group of notes that has melodic plausibility. There are scales of 4 notes only; and there are scales and patterns of 12 different notes. But counting repeated notes appearing in different octaves, a scale may have as many as 48 functionally different notes, as in the Disjunct Major Polytetrachord (No. 958). As to melodic patterns, there is virtually no limit to the number of such tones.

The THESAURUS is arranged in the form of piano scales and melodic studies. No fingering is given, for the pianist will readily find the type of digitation best suited to the hand. Other instrumentalists, too, will find most of the scales and melodic patterns in the THESAURUS adaptable to their instruments. The notation throughout is enharmonic, and accidentals are used according to convenience. Double sharps and double flats are avoided entirely. Precautionary natural signs are placed here and there when an unusual melodic interval occurs. All accidentals affect only the note immediately following.

The scales and patterns in the THESAURUS are arranged according to the principal interval of each particular section. In order to avoid association with a definite tonality, these basic intervals are here referred to by Latin and Greek names derived from old usage. In addition, new terms had to be coined for intervals not in the system of historic scales. In these new terms the prefix *sesqui* stands for the addition of one-half of a tone. Thus, Sesquitone is 1½ tones, or a minor third; Sesquiquadritone is 4½ tones, or a major sixth; and Sesquiquinquetone is 5½ tones, or a major seventh.

The table of intervals from the semitone to the major seventh appears as follows:

| | | | |
|---|---|---|---|
| *Semitone* | Minor Second | *Tritone* | Augmented Fourth |
| *Whole Tone* | Major Second | *Diapente* | Perfect Fifth |
| *Sesquitone* | Minor Third | *Quadritone* | Minor Sixth |
| *Ditone* | Major Third | *Sesquiquadritone* | Major Sixth |
| *Diatessaron* | Perfect Fourth | *Quinquetone* | Minor Seventh |
| *Sesquiquinquetone* | Major Seventh | | |

The interval of a major ninth is called Septitone, to indicate that it contains 7 whole tones.
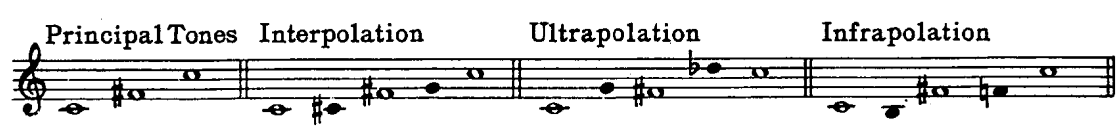
These basic intervals are regarded as fractions of one or more octaves. Thus, the Tritone Progression represents the division of the octave into 2 equal parts, and it produces sequential scales and patterns. The Ditone Progression is the division of the octave into 3 equal parts, and is intervallically identical with the augmented triad. The Sesquitone Progression is the division of the octave into 4 equal parts, and is identical with the familiar diminished-seventh chord. The Whole-Tone scale represents the equal division of the octave into 6 parts. The Semitone Progression is equivalent to the chromatic scale. By the process of permutation the chromatic scale is productive of characteristic patterns of the 12-tone technique.
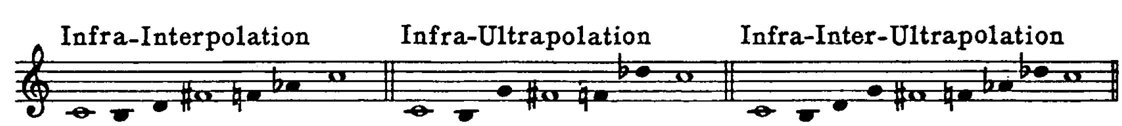
By dividing 2 octaves into 3 equal parts we obtain the Quadritone Progression, which is closely related to the Ditone Progression, being in fact a spread-out augmented triad. By dividing 3 octaves into 4 equal parts we obtain the interval of the major sixth. This is the Sesquiquadritone Progression, which is an unfolded Sesquitone Progression, productive of patterns related to diminished-seventh harmonies.

In the cycle of scales the interval of a perfect fifth is one-twelfth part of 7 octaves, and it is so represented in the Diapente Progression. A perfect fourth is one-twelfth part of 5 octaves, and is classified as such in the section Diatessaron Progression.

Pursuing a similar process, we find that the Sesquiquinquetone Progression, or the progression of major sevenths, is the result of the equal division of 11 octaves into 12 parts. Finally, the Septitone Progression is the equal division of 7 octaves into 6 parts, with the basic interval of a major ninth.

Scales and melodic patterns are formed by the processes of Interpolation, Infrapolation, and Ultrapolation. The word Interpolation is in common usage; here it signifies the insertion of one or several notes between the principal tones. Infrapolation and Ultrapolation are coined words. Infrapolation indicates the addition of a note below a principal tone; Ultrapolation is the addition of a note above the next principal tone. Infrapolation and Ultrapolation result in the shift of direction, with the melodic line progressing in zigzags. Infrapolation, Interpolation and Ultrapolation may be freely combined, resulting in hyphenated forms: Infra-Interpolation, Infra-Ultrapolation, and Infra-Inter-Ultrapolation.






Progressions and patterns based on unequal division of the octave are exemplified by Heptatonic scales and Pentatonic scales. Among Heptatonic scales, or 7-tone scales, are our familiar major and minor scales as well as the church modes. In the section Heptatonic Arpeggios the scales are spread out in thirds. In the section Bitonal Arpeggios the C major arpeggio is combined with arpeggios in all other 23 major and minor keys.

Busoni, who had earnestly explored new musical resources, found 113 different scales of 7 notes. Mentioning as an example the scale: C, Db, Eb, Fb, Gb, Ab, Bb, C (it is No. 1035 in the THESAURUS), he writes in his *Entwurf einer neuen Aesthetik der Tonkunst:* "There is a significant difference between the sound of this new scale when C is taken as the tonic and when it is taken as the leading tone of the scale of Db minor. By harmonizing the tonic with the customary C major triad as a fundamental chord, a novel harmonic sensation is obtained."

In his *Chronicle of My Musical Life* Rimsky-Korsakov mentions the use he made of an 8-tone scale, formed by alternating major and minor seconds. This is Scale No. 393 in the THESAURUS. Sporadic uses of the Whole-Tone scale are found in Glinka and even in Mozart (as a jest to mock the inept *Dorfmusikanten*), but it did not become a deliberate device before Debussy. In Debussy's piano piece *Voiles* the principal melodic structure is in the Whole-Tone scale, but the middle part is written exclusively on the black keys, exemplifying the Pentatonic scale.

The Whole-Tone scale has 6 notes to the octave; the Pentatonic scale has five. The Whole-Tone scale is possible in only one form on a given note, but there can be many Pentatonic scales. There are 49 Pentatonic scales in the THESAURUS.

The 12-Tone Technique of composition promulgated by Schoenberg is based on permutations of the Semitone scale. Various 12-tone patterns are found in the THESAURUS in examples No. 1214 to No. 1318. For example, it is possible to arrange the 12 chromatic tones in 2 major and 2 minor triads without repeating a note. It is also possible to form 4 mutually exclusive augmented triads using all 12 chromatic tones. The theme of Liszt's *Faust* Symphony is composed of 4 augmented triads. It is further possible to split the chromatic scale into a diminished triad, a minor triad, a major triad, and an augmented triad. These mutually exclusive triads can be arranged in the form of Quadritonal Arpeggios.

A recent development of the 12-Tone Technique is the 11-interval technique, which prescribes the formation of progressions containing 11 different intervals. The idea was first introduced by the Austrian musician Fritz Klein in 1921 in a curious composition entitled *Die Maschine,* with the sub-title *Ex-Tonal Self-Satire*. The name of the composer was concealed behind a characteristic nom de plume *Heautontimorumenus* which means Self-Torturer. In this piece Klein introduced a Mother Chord which contains not only all 11 different intervals, but 12 different notes as well.

A further elaboration on the Mother Chord is an invertible 11-interval, 12-tone chord introduced by the author and appropriately christened Grandmother Chord. It has all the intervallic properties of the Mother Chord plus an especial order of intervals so arranged that they are alternately odd-numbered and even-numbered when counted in semitones, with the row of odd-numbered intervals forming a decreasing arithmetical progression and the row of even-numbered intervals forming an increasing arithmetical progression. The order of notes in the Grandmother Chord is identical with the 12-tone Spiral Pattern No. 1232a.

All chords composed of 11 different intervals add up to the interval of 66 semitones, which is the sum of the arithmetical progression from 1 to 11. The interval of 66 semitones equals 5½ octaves, and so forms a Tritone between the lowest and the highest tones in the Pyramid Chord, Mother Chord, Grandmother Chord, and other 11-interval structures.

Scales and patterns listed in the main body of the THESAURUS readily lend themselves to new melodic possibilities. For instance, a descending scale may be played in the form of the melodic inversion of the ascending scale, as suggested in the section Mirror Interval Progressions. It is possible to form complementary scales in the range of 2 octaves, by using in the second octave the notes not used in the first. Other possibilities for the formation of new patterns are demonstrated in the section on Permutations.

A Diatonic counterpart of the 12-Tone Technique is the system of Pandiatonic composition. The term Pandiatonic, first introduced by this writer in 1937, denotes the free use of all 7 tones of the diatonic scale, both melodically and harmonically. In one-part Pandiatonic Progressions, the melody is made up of 7 different notes of the diatonic scale. Such a progression may then be melodically inverted, read backward, or both, resulting in 4 different forms. Pandiatonic Counterpoint in strict style uses progressions of 7 different notes in each voice, with no vertical duplication.

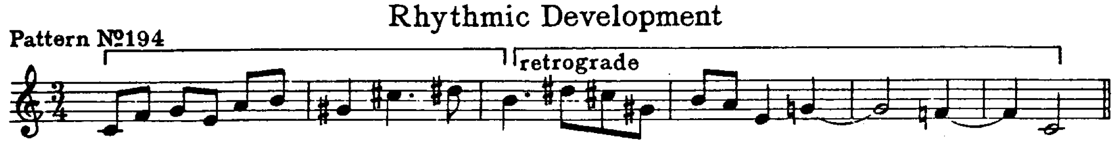
Pandiatonic Harmony is the twentieth century counterpart of classical harmony. Modern composers of such varied backgrounds and musical persuasions as Ravel, Stravinsky, Hindemith, Milhaud, Copland and Roy Harris make use of this technique, arriving at it by different creative processes. Jazz composers, too, have found, by sheer experimentation, effective application for the enriched chords of Pandiatonic formations. It is a common practice to end an orchestral arrangement of a popular song by the enriched major triad with an added sixth, seventh, or ninth.

The concluding sections of the THESAURUS demonstrate the various methods by which tonal materials may be used to best advantage. The section Double Notes shows the combinations derived from corresponding scales and patterns. Plural Scales and Arpeggios give examples of common major and minor progressions arranged consecutively in chromatic transposition. Polytonal Scales are simultaneous progressions in different keys. Polyrhythmic Scales are progressions in different rhythms. Polytonal Polyrhythmic Scales combine different rhythms in different tonalities.

A special word is to be said about Palindromic Canons. Palindromes are words or sentences that read the same forward or backward, as the sentence *Able Was I Ere I Saw Elba* (applied to Napoleon). Similarly, Palindromic Canons read the same backward or forward. The two Palindromic Canons based on Pattern No. 72 are particularly interesting. They result in a progression of enharmonic triads or their inversions, alternating in major and minor keys.

Fragments of the scales and patterns in the THESAURUS may be used as motives and themes. The rhythmical elaboration is left to the imagination of the composer. By using a portion of a pattern in forward and retrograde motion, in varied rhythms within a given meter, it is possible to form an unlimited number of melodic figures.

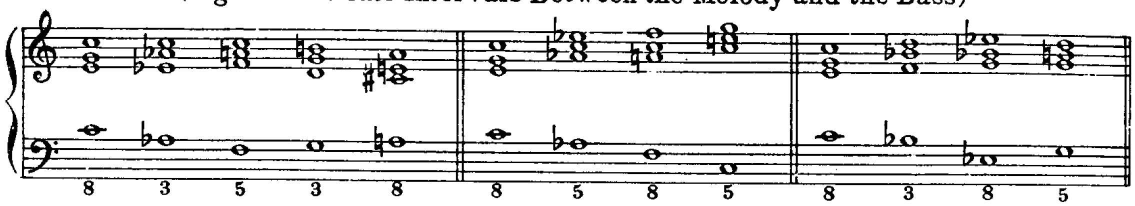
Rhythmic Development



Two formulas are used in the harmonization of the scales and patterns: one by common triads, and one by seventh-chords. In the harmonization by common triads, only root positions of major triads in close harmony are applied. Either the root, the third, or the fifth may appear in the melody. These positions are referred to as Octave, Tertian, and Quintan, or in figures, 8, 3, and 5. When the melody ascends, diatonically or chromatically, the positions change from the Octave to the Tertian to the Quintan to the Octave. When the melody descends, the order of the positions is reversed. Furthermore, the order of positions may be reversed at the end of a cadence even in ascending motion. When the melody is stationary, the order of positions is free. The resulting harmony traverses several tonalities in an alternation of successive major chords.

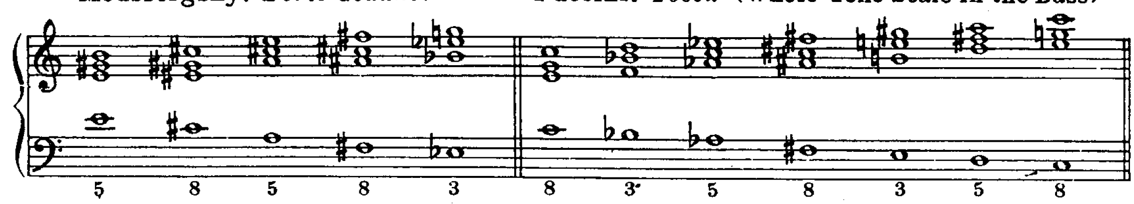
### Harmonization in Major Triads

(Figures Indicate Intervals Between the Melody and the Bass)



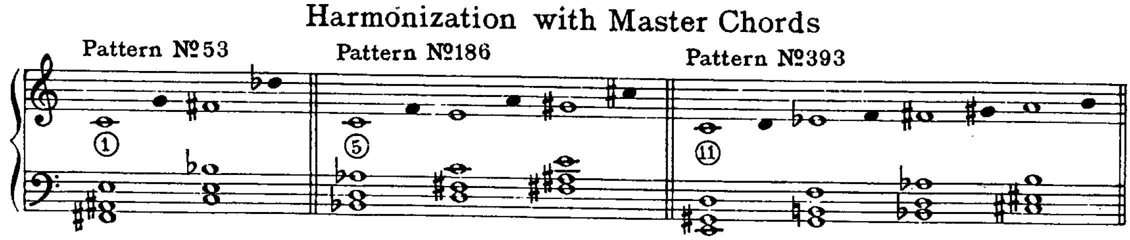

The harmonization in major triads is found in the music of Debussy, Moussorgsky, and other composers of the French and Russian schools. A classical example is the scene in the monk's cell in Moussorgsky's opera *Boris Godunov.* In the second act of Puccini's opera *Tosca* the Whole-Tone scale in the bass is harmonized by a row of major triads with the positions following the Octave-Tertian-Quintan (8-3-5) formula.

Moussorgsky: *Boris Godunov* Puccini: *Tosca* (Whole-Tone Scale in the Bass)




The second type of harmonization is effected by means of Master Chords. These Master Chords are dominant-seventh chords with the fifth omitted. In combination with melodic elements of a given scale or pattern, these chords form harmonic structures of the type of seventh-chords, ninth-chords, or whole-tone chords. The Master Chords are indicated for ascending scales and patterns in the sections Tritone Progression, Ditone Progression and Sesquitone Progression by figures within circles, as ⑤, and are used to harmonize an entire rhythmic group in a given progression. In the Tritone and Sesquitone Progressions it is also possible to harmonize the entire octave range with a single Master Chord. Furthermore, any Master Chord suitable for harmonization of a given progression may be transposed a tritone up or down with satisfactory results.

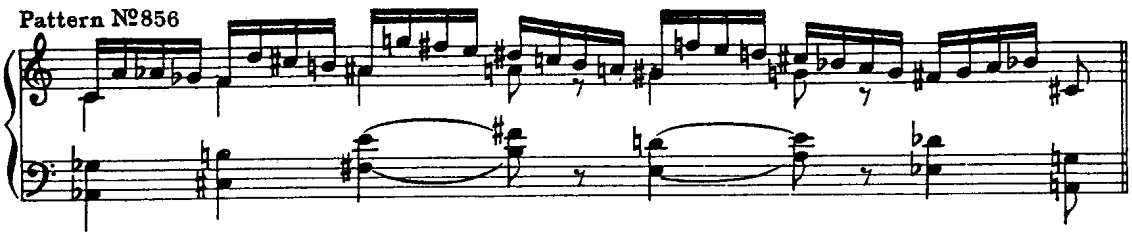
### Harmonization with Master Chords



Harmonization of both types is given in the tables on pp.240-241. To harmonize in major triads, it is necessary to alternate the Octave, Tertian, and Quintan positions given in the table. In harmonizing by seventh-chords, ninth-chords, and whole-tone chords, any chord under a given melody note will furnish a workable harmony.

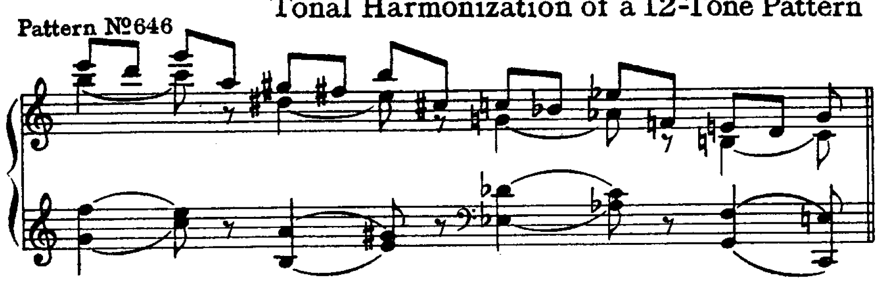
The patterns in the Diatessaron and Diapente Progressions lend themselves to harmonization characteristic of the Dominant-Tonic cycle. When harmonized in consecutive seventh-chords, such patterns acquire a Schumannesque quality.

**Harmonization in Seventh-Chords**




A harmonization of the Dominant-Tonic type will impart a feeling of tonality even to a 12-tone progression.

**Tonal Harmonization of a 12-Tone Pattern**




Traditional harmonization in major and minor keys uses chords formed by the diatonic scale. Similarly, new scales may be harmonized with the aid of chords formed by the notes of the scale itself. Examples of such Autochordal Harmonization are given in a special table. There are scales that admit of only 2 different triads, as Scale No. 7, which can be harmonized with C major and F♯ major triads. The 8-tone scale No. 393 is capable of forming 8 different triads, while other scales, such as No. 5, do not yield a single triad.

All scales and patterns in the THESAURUS are centered on C as the initial and concluding tone. It goes without saying that these progressions can be transposed to any tonal center according to a composer's requirements.

John Stuart Mill once wrote: "I was seriously tormented by the thought of the exhaustibility of musical combinations. The octave consists only of five tones and two semitones, which can be put together in only a limited number of ways of which but a small proportion are beautiful: most of these, it seemed to me, must have been already discovered, and there could not be room for a long succession of Mozarts and Webers to strike out, as these have done, entirely new surpassing rich veins of musical beauty. This sort of anxiety, may, perhaps, be thought to resemble that of the philosophers of Laputa, who feared lest the sun be burnt out."

The fears of John Stuart Mill are unjustified. There are 479,001,600 possible combinations of the 12 tones of the chromatic scale. With rhythmic variety added to the unbounded universe of melodic patterns, there is no likelihood that new music will die of internal starvation in the next 1000 years.

NICOLAS SLONIMSKY

1 January 1947 Boston, Massachusetts

# EXPLANATION OF TERMS

AUTOCHORDAL HARMONIZATION. Application of chords derived from the tones of a given scale (Example, Scale No. 12: C, D♯, F, F♯, A, B, C, harmonized in 2 triads, F major and B major).

BITONAL ARPEGGIOS. [Nos. 1191-1213]. Melodic progressions formed of alternating arpeggios in 2 different keys.

BITONAL PALINDROMIC CANONS. Canons that result in the formation of 6-tone chords composed of 2 triads (Example, Scale No. 7: C, C♯, E, F♯, G, A♯, C, developed canonically, forming bitonal chords of C major and F♯ major).

CHORD OF THE MINOR 23RD. Chord consisting of 12 different notes, arranged in thirds, and forming 4 mutually exclusive triads.

COMPLEMENTARY SCALES. Melodic progressions of two octaves in range, comprising all 12 tones of the chromatic scale (Example, C major scale plus the pentatonic scale on black keys).

CONJUNCT POLYTETRACHORD. Progression of 12 tetrachords traversing all 12 keys, with the terminal tone of one tetrachord being the initial tone of the next (Examples, Phrygian Polytetrachord, No. 830; Minor Polytetrachord, No. 832; Major Polytetrachord, No. 833).

CROSSING INTERVALS. [Nos. 1243-1250]. Two overlapping 6-tone rows comprising all 12 different tones, each row forming a progression of major or minor seconds, thirds, fourths, fifths and sixths.

DIAPENTE. Interval of 3½ tones; a perfect fifth.

DIATESSARON. Interval of 2½ tones; a perfect fourth.

DISJUNCT POLYTETRACHORD. Progression of 12 tetrachords traversing all 12 keys, with adjacent tetrachords separated by one diatonic degree (Examples, Disjunct Phrygian Polytetrachord, No. 951; Disjunct Minor Polytetrachord, No. 956; Disjunct Major Polytetrachord, No. 958; Disjunct Lydian Polytetrachord, No. 959).

DITONE. Interval of 2 whole tones; a major third.

GRANDMOTHER CHORD. Chord, invented by Nicolas Slonimsky on February 13, 1938, containing all 12 different tones and different intervals symmetrically invertible in relation to the central interval, the tritone, which is the inversion of itself; the intervallic structure being a row of alternatingly odd and even intervals (counted in semitones), the odd-numbered series forming a diminishing arithmetical progression, and the even-numbered series an increasing progression.

HEPTATONIC ARPEGGIOS. [Nos. 1088-1141]. Melodic progressions by thirds derived from Heptatonic scales.

HEPTATONIC SCALES. [Nos. 1034-1087]. Diatonic progressions of 7 degrees, such as major and minor scales and church modes, and also scales containing 1 or 2 augmented seconds.

INFRA-INTER-ULTRAPOLATION. Pattern formed by the insertion of notes below, between, and above the principal tones of a progression (Example, Pattern No. 341).

INFRAPOLATION. Insertion of a note below the principal tones of a progression (Example, Pattern 231).

INTERPOLATION. Insertion of one or more notes between the principal tones of a progression (Example, Scale No. 21).

INTER-ULTRAPOLATION. Insertion of 2 notes, one between the principal tones of a given progression, the other above the principal tone (Example, Pattern No. 123).

MAJOR BITONAL CHORD. Chord of 2 major triads usually in keys whose tonics are at the interval of a tritone, as C major and F♯ major.

MAJOR POLYTETRACHORD. A series of major tetrachords, conjunct or disjunct, covering all 12 major keys (Examples, No. 833 and No. 958).

MASTER CHORDS. Dominant-seventh chords with the fifth omitted, tabulated chromatically in 12 different keys, to be used in harmonizing scales and melodic patterns, and indicated by figures, enclosed in circles, from 1 to 12.

MINOR BITONAL CHORD. Chord consisting of 2 minor chords, usually with tonics at the interval of a tritone, as C minor and F♯ minor.

MINOR POLYTETRACHORD. A series of minor tetrachords, conjunct or disjunct, covering all 12 minor keys (Examples, No. 832 and No. 956).

MIRROR INTERVAL PROGRESSIONS. Scales and patterns in which the descending figure is the melodic inversion of the ascending figure (Example, Scale No. 1 ascending is the mirror inversion of Scale No. 4 descending).

MOTHER CHORD. Chord, introduced by Fritz Klein in 1921, containing all 12 tones and 11 different intervals.

MUTUALLY EXCLUSIVE TRIADS. Four triads (major, minor, diminished or augmented) comprising all 12 different tones (Example, C major, F♯ major, D minor, and G♯ minor).

NON-SYMMETRIC INTERPOLATION. Free insertion of additional notes between the principal tones.

OCTAVE POSITION. In four-part harmony, a triad with the root both in the melody and in the bass.

PALINDROMIC CANONS. Canons that read the same backward or forward.

PANDIATONIC HARMONY. Part-writing in chords freely combined from the 7 tones of the diatonic scale.

PANDIATONIC PROGRESSIONS. Tonal rows composed of all 7 different tones of the diatonic scale.

PATTERN. Melodic figure in which the direction changes from ascending to descending, or vice versa, before arriving at the terminal point (All infrapolated and ultrapolated progressions are patterns).

PENTATONIC SCALES. [Nos. 1142-1190]. Scales of 5 notes.

PERMUTATION. Distribution of notes of a given melodic pattern in different orders of succession.

PHRYGIAN POLYTETRACHORD. Polytetrachord composed of 12 conjunct or disjunct Phrygian tetrachords (1 semitone plus 2 whole tones), (Examples, No. 830 and No. 951).

PLURAL SCALES. Progressions formed by disjunct scales, as C major, D♭ major, D major, and E♭ major.

POLYRHYTHMIC SCALES. Simultaneous progressions in different rhythms.

POLYTETRACHORD. Progression of 12 tetrachords passing through all 12 keys conjunctly (with the last tone of one tetrachord coinciding with the first tone of the next), or disjunctly (with the terminal tone of the first tetrachord separated by a diatonic degree from the initial tone of the next).

POLYTONAL POLYRHYTHMIC SCALES. Simultaneous progressions in different keys and in different rhythms.

POLYTONAL SCALES. Scales in different tonalities played simultaneously.

PROGRESSION. General term for any scale or melodic pattern.

PROMETHEUS SCALE. [No. 50]. The 6-tone scale (C, D, E, F♯, A, B♭) used by Scriabin in his symphonic poem *Prometheus.*

PYRAMID CHORD. Chord, introduced by Fritz Klein in 1921, composed of a series of diminishing intervals from an octave to a semitone.

QUADRITONE. Interval of 4 whole tones; a minor sixth.

QUADRITONAL ARPEGGIOS. [Nos. 1251-1291]. Melodic progressions formed by 4 mutually exclusive triads, as C major, D minor, F♯ major, and G♯ minor.

QUARTAL CHORD. 12-tone chord arranged in perfect fourths.

QUINQUETONE. Interval of 5 whole tones; a minor seventh.

QUINTAN POSITION. In four-part harmony, a triad with the root in the bass and the fifth in the melody.

SCALE. Progression of tones changing its direction only at terminal points (All interpolated progressions are scales).

SEMITONE PROGRESSION. Scale consisting of consecutive semitones; a chromatic scale.

SEPTITONE. Interval of 7 whole tones; a major ninth.

SESQUI. Prefix signifying the addition of a semitone to a given interval (Sesquitone = 1½ tones; Sesquiquadritone = 4½ tones).

SESQUIQUADRITONE. Interval of 4½ tones; a major sixth.

SESQUIQUINQUETONE. Interval of 5½ tones; a major seventh.

SESQUITONE. Interval of 1½ tones; a minor third.

SPIRAL PATTERNS. Melodic progressions converging toward a central tone.

SYMMETRIC INTERPOLATION. Insertion of notes at equal intervals from respective pivotal points, resulting in invertible progressions (Example, Scale No. 37: C, D, F, F♯, G, B♭, C, in which the intervals are the same from C upward and from the upper C downward).

TERTIAN POSITION. In four-part harmony, a triad with the root in the bass and the third in the melody.

TONE-CLUSTER. Term, introduced by Henry Cowell, signifying a complex of notes filling one or more octaves, diatonically, chromatically, or pentatonically.

TRITONE. Interval of 3 whole tones; an augmented fourth, or a diminished fifth.

TWELVE-TONE PROGRESSIONS. Melodic figures of 12 different tones.

ULTRAPOLATION. Insertion of one or more notes above a principal tone of a scale (Example, Pattern No. 53, in which G is inserted above F♯).

WHOLE-TONE CHORDS. Chords composed of intervals of one or several whole tones each.

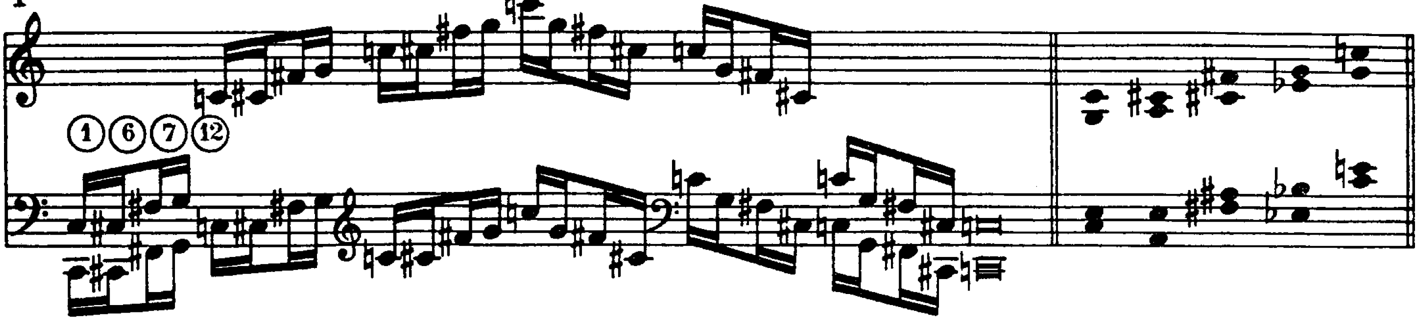
# Tritone Progression

## Equal Division of One Octave into Two Parts

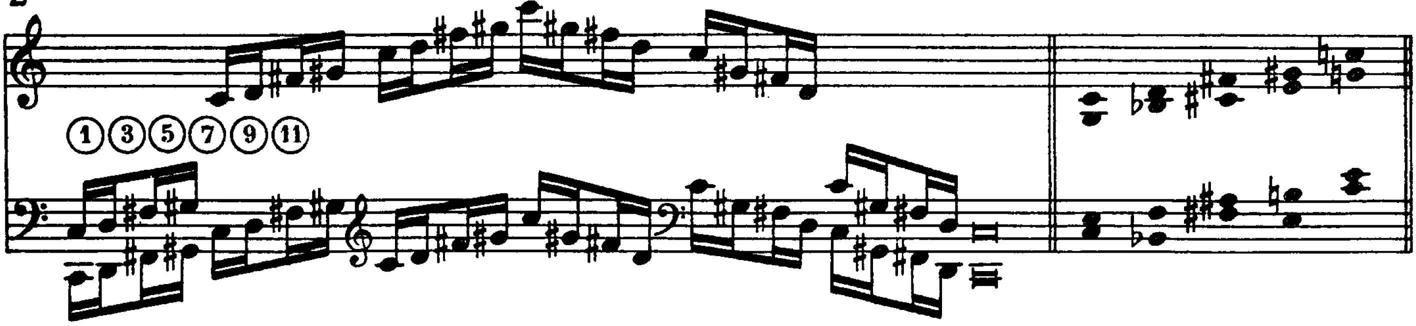


## Interpolation of One Note

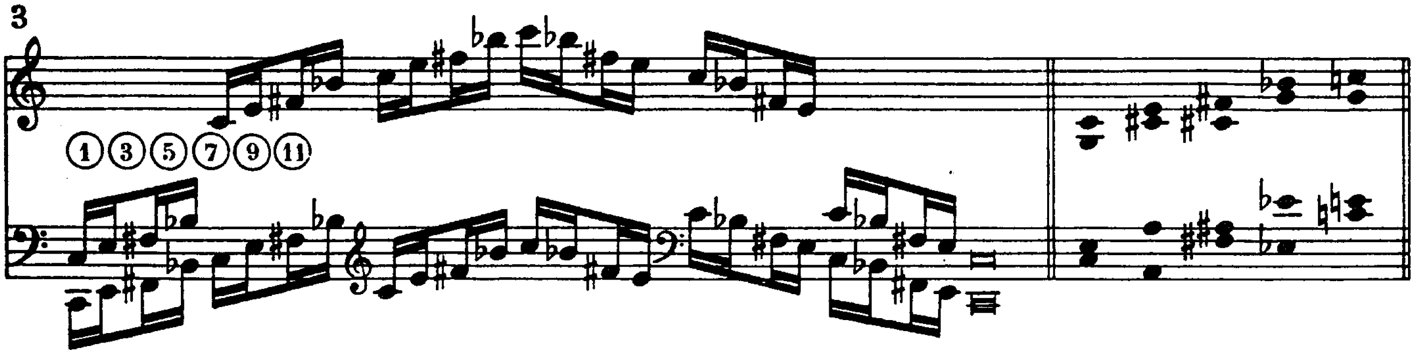
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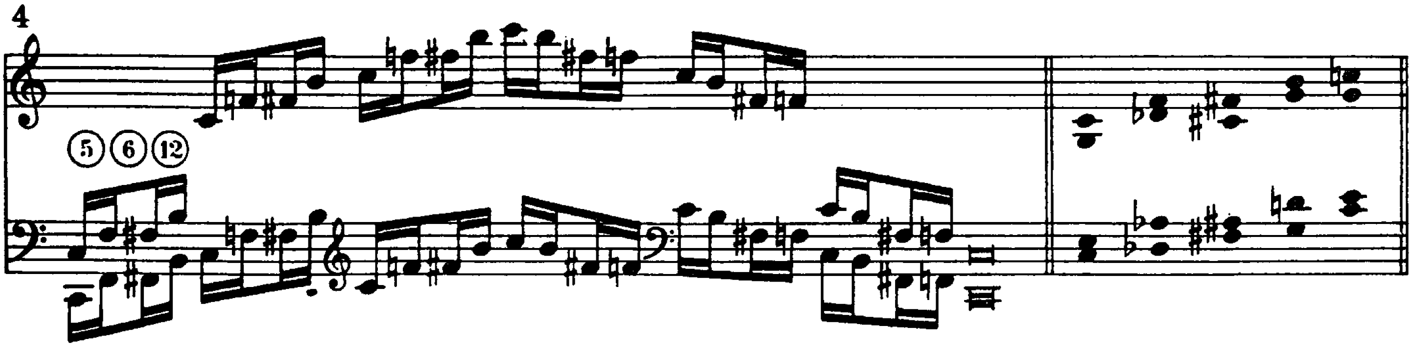

2




3
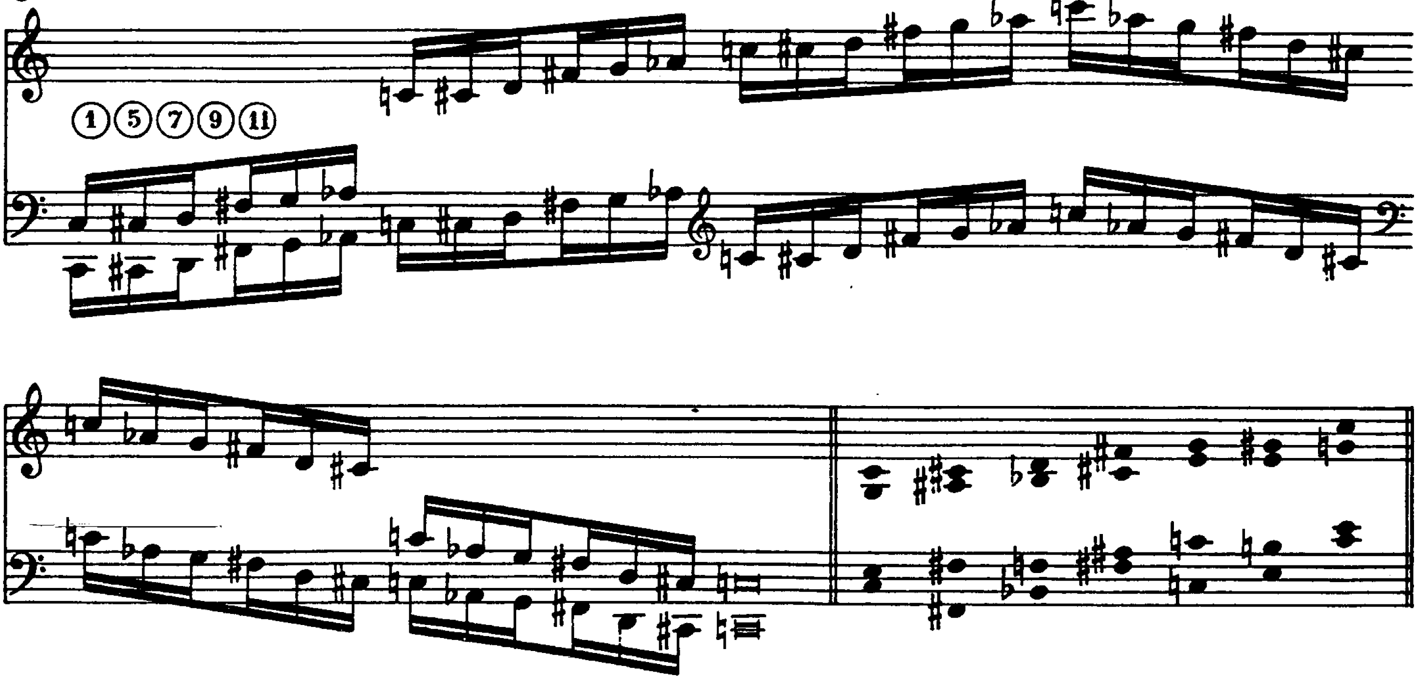



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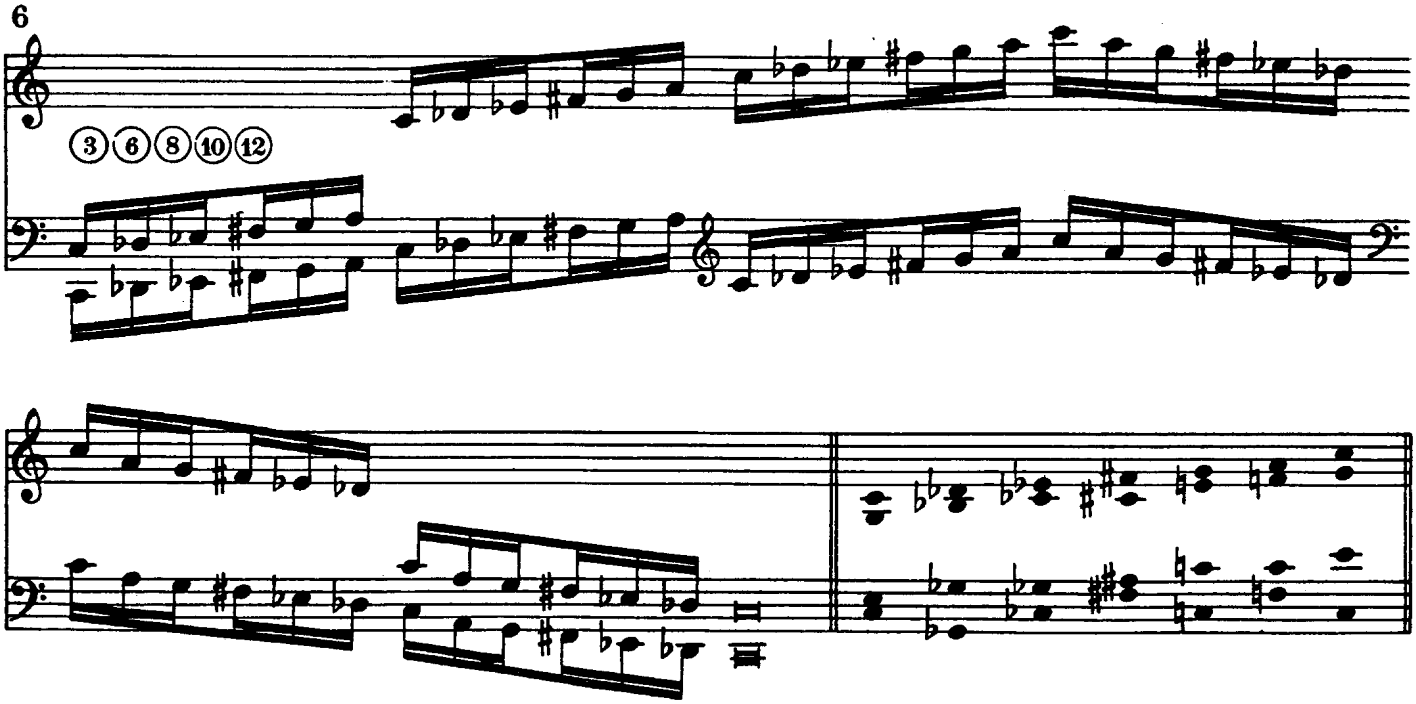



①②③④⑤⑥⑦⑧⑨⑩⑪⑫ **indicate Master Chords.**

# Interpolation of Two Notes
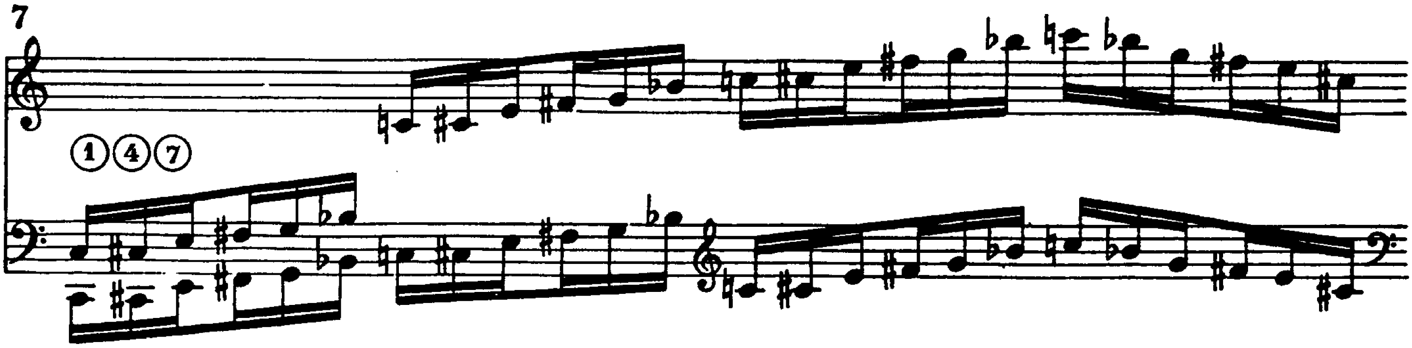
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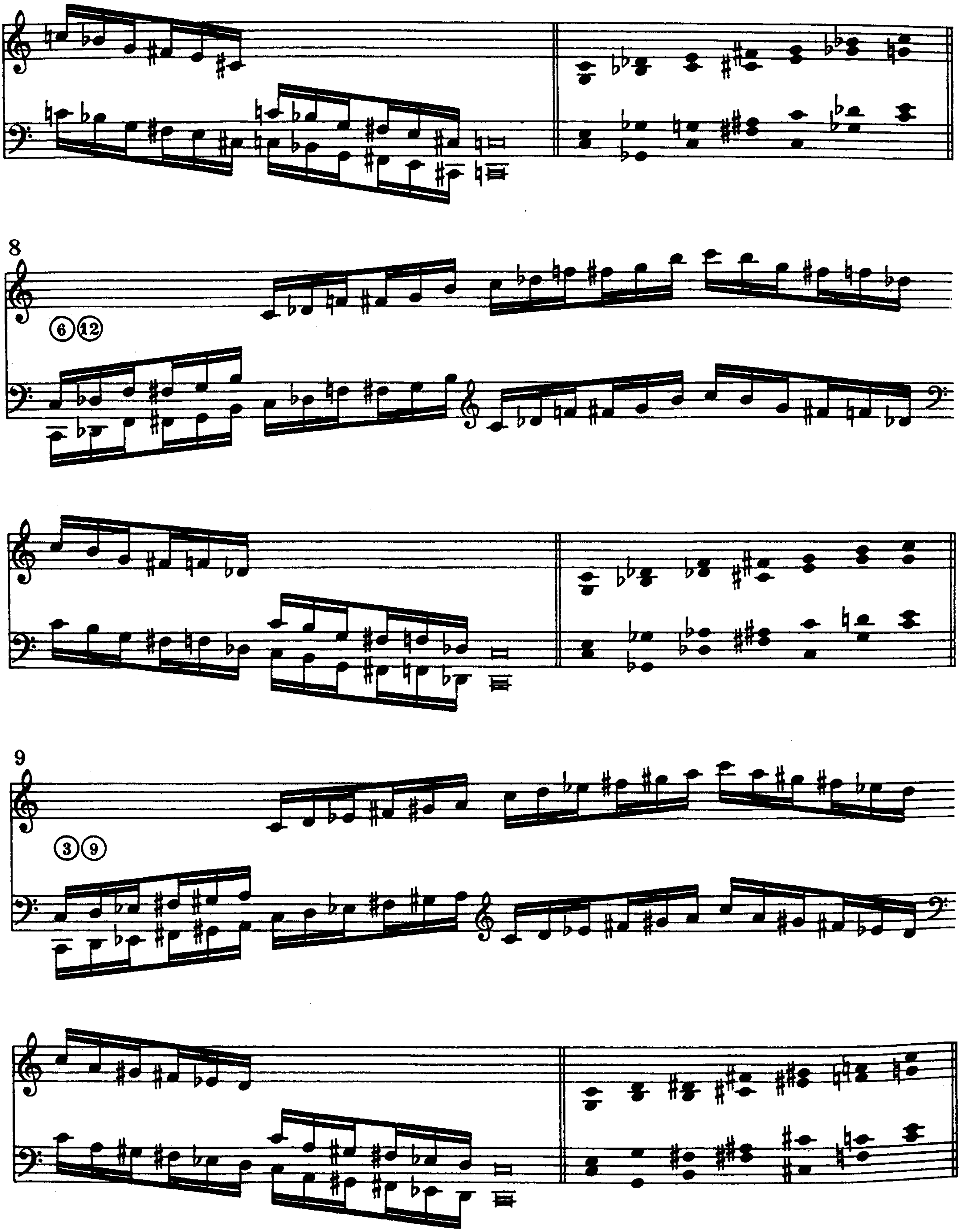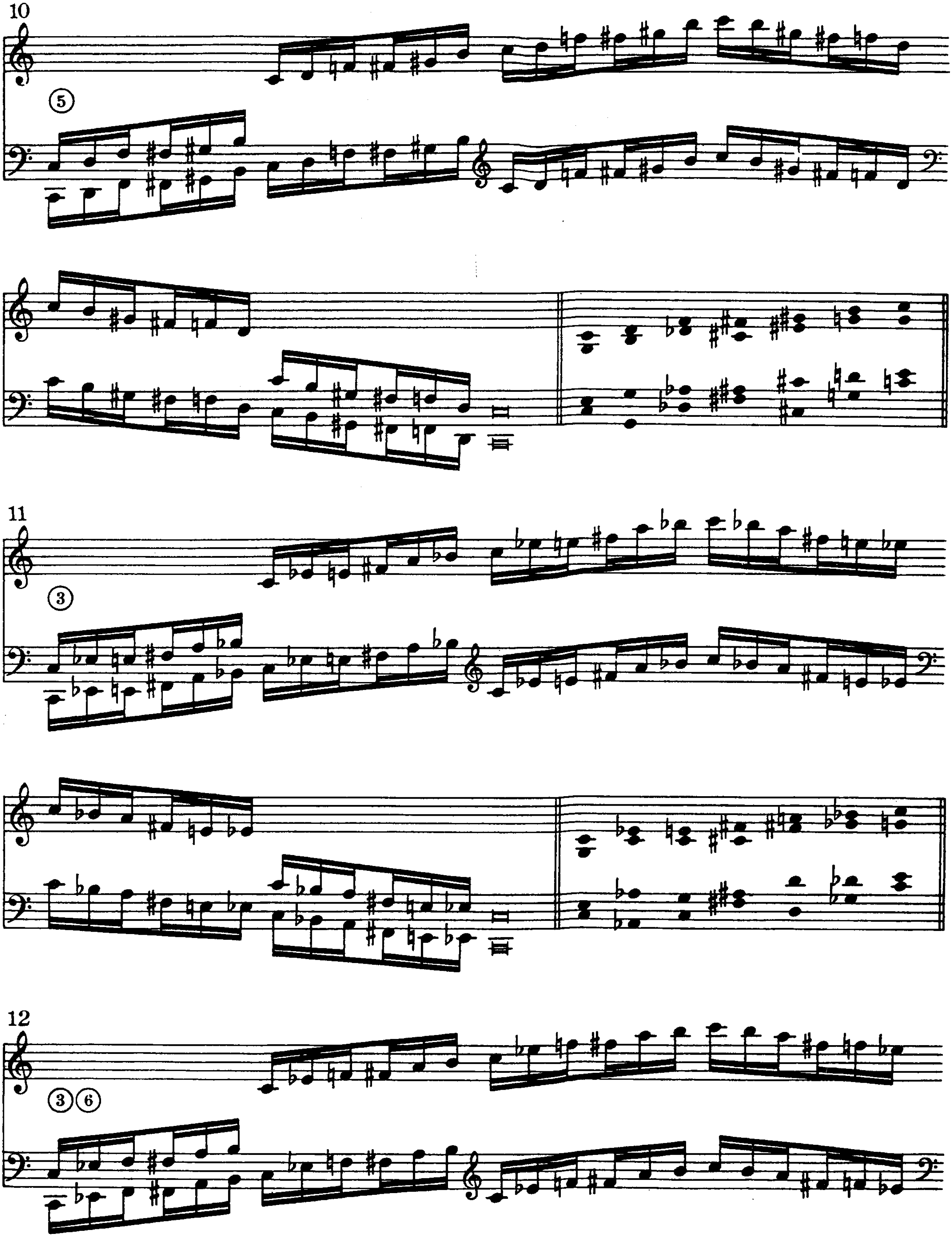



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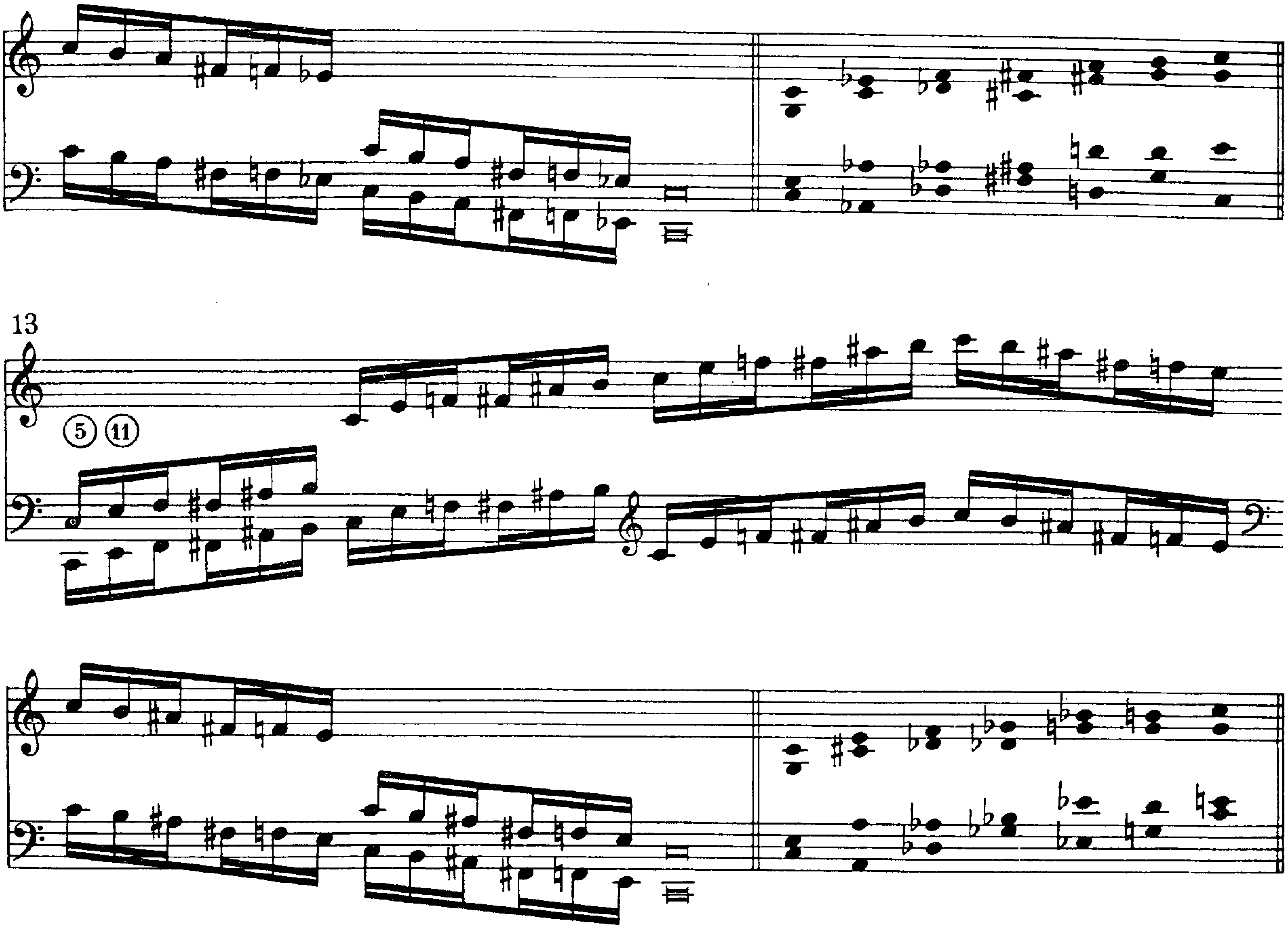



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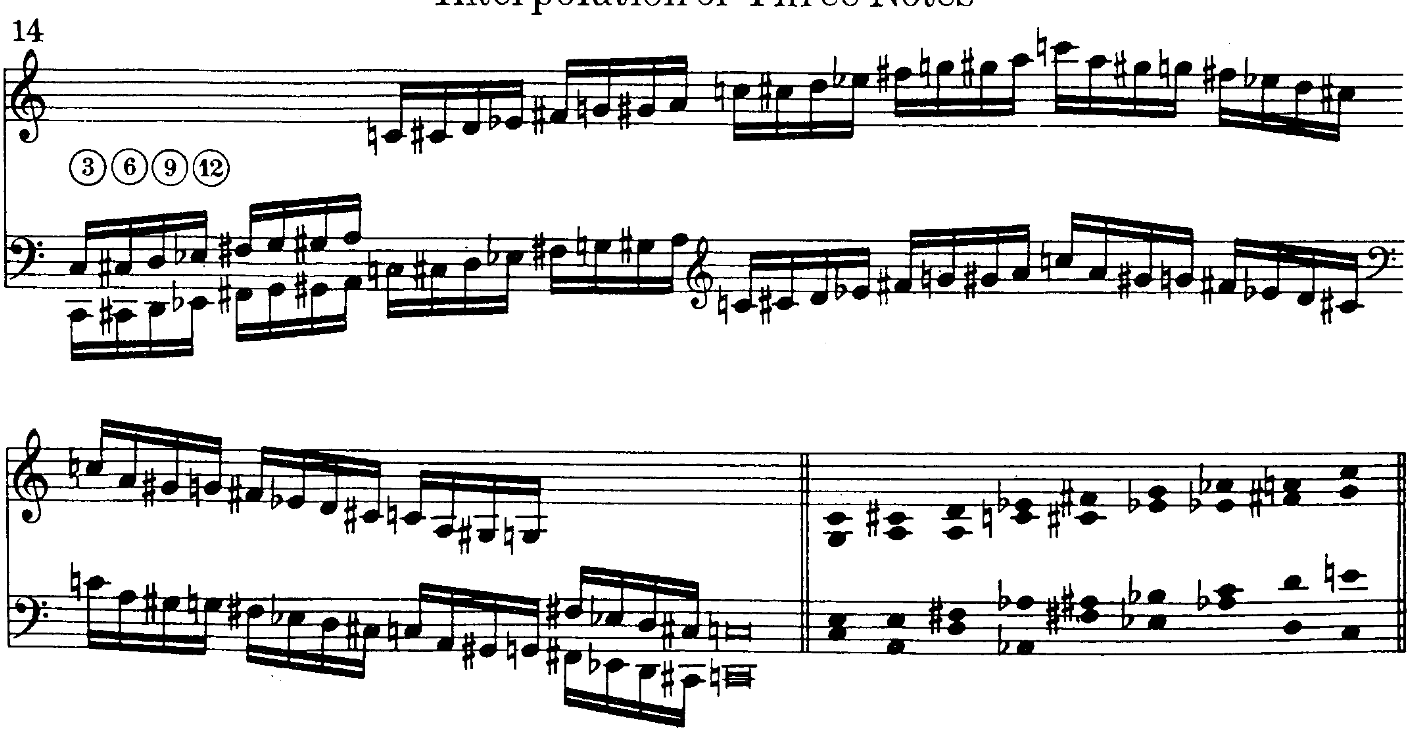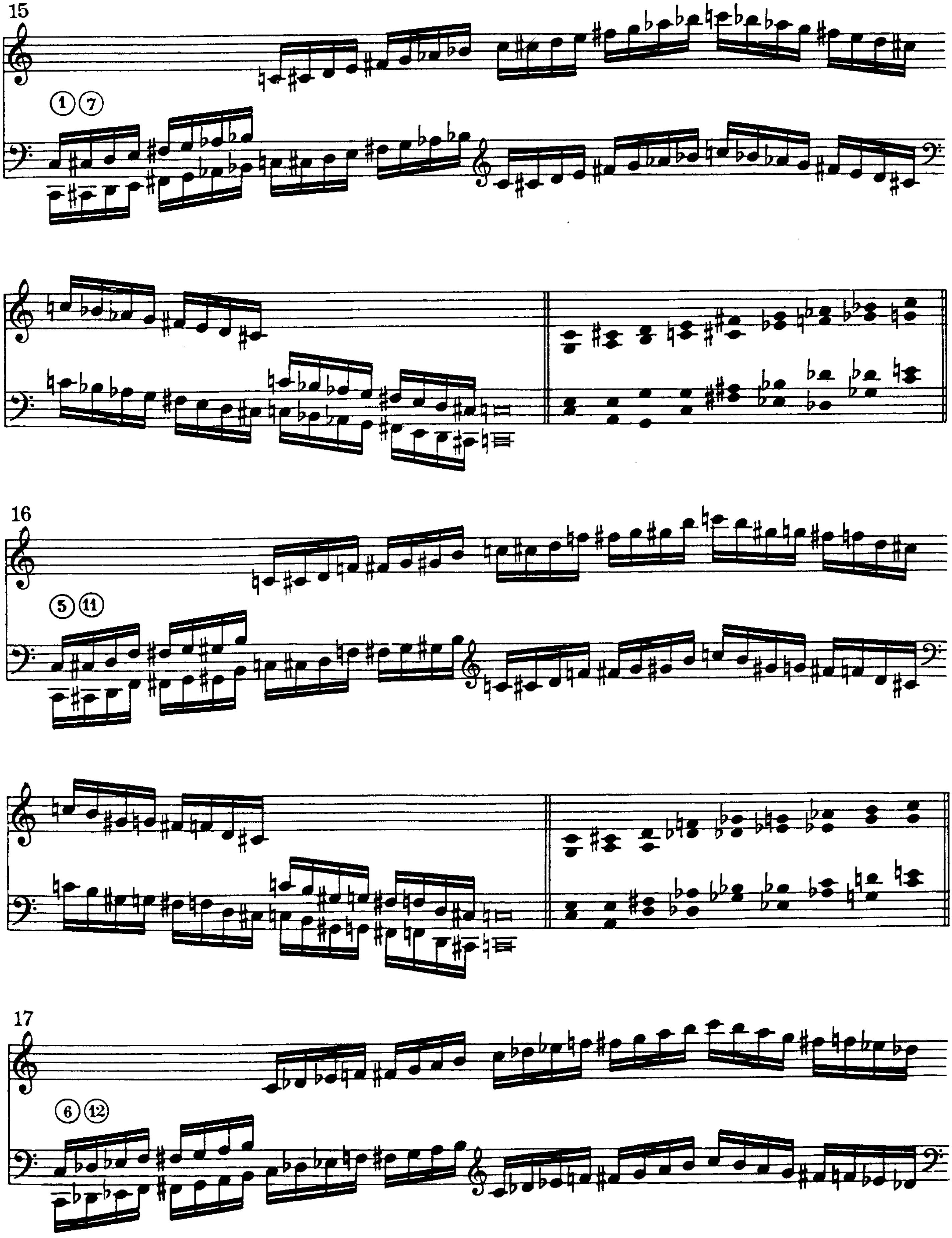



8
⑥⑫
9
③⑨
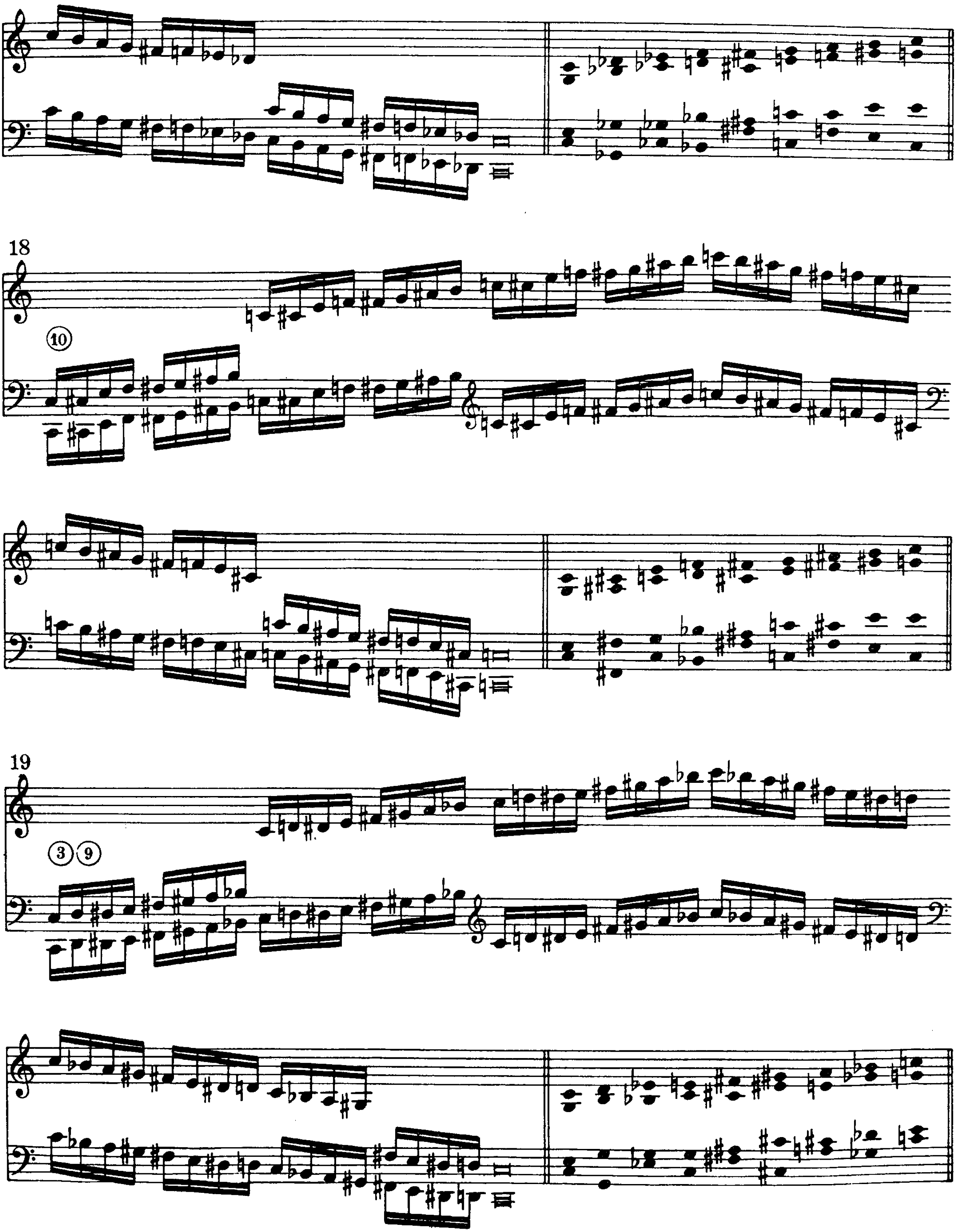

10
5
11
3
12
3 6
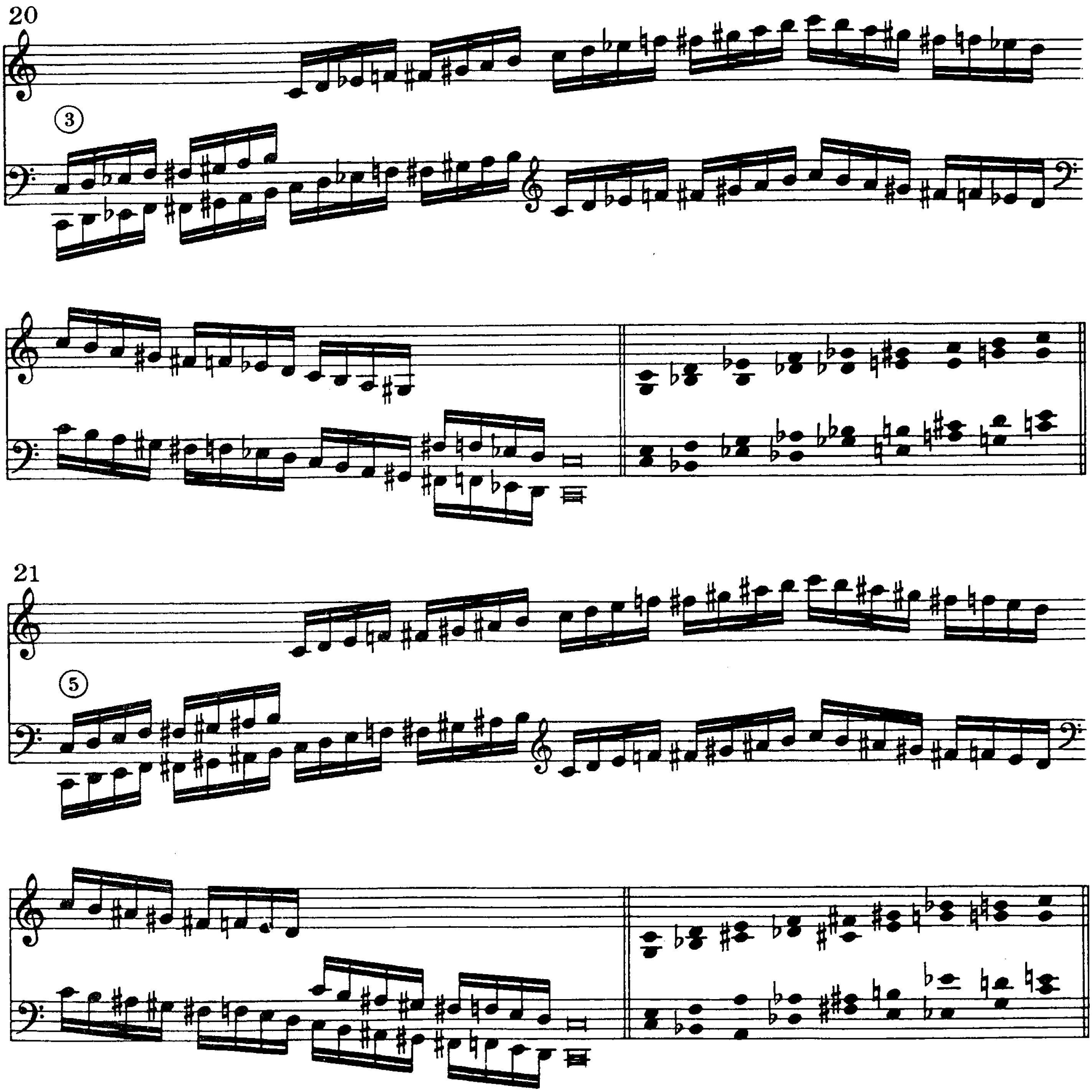



## Interpolation of Three Notes

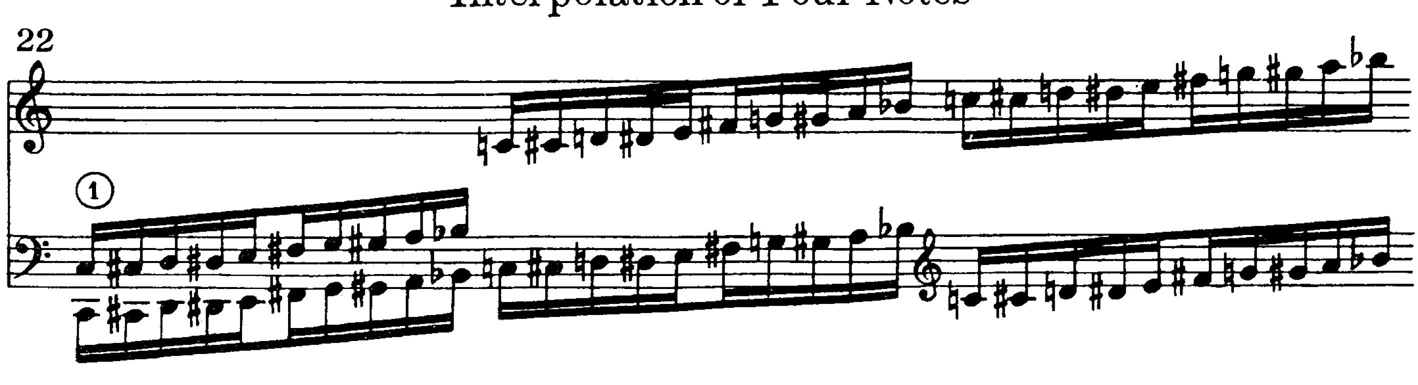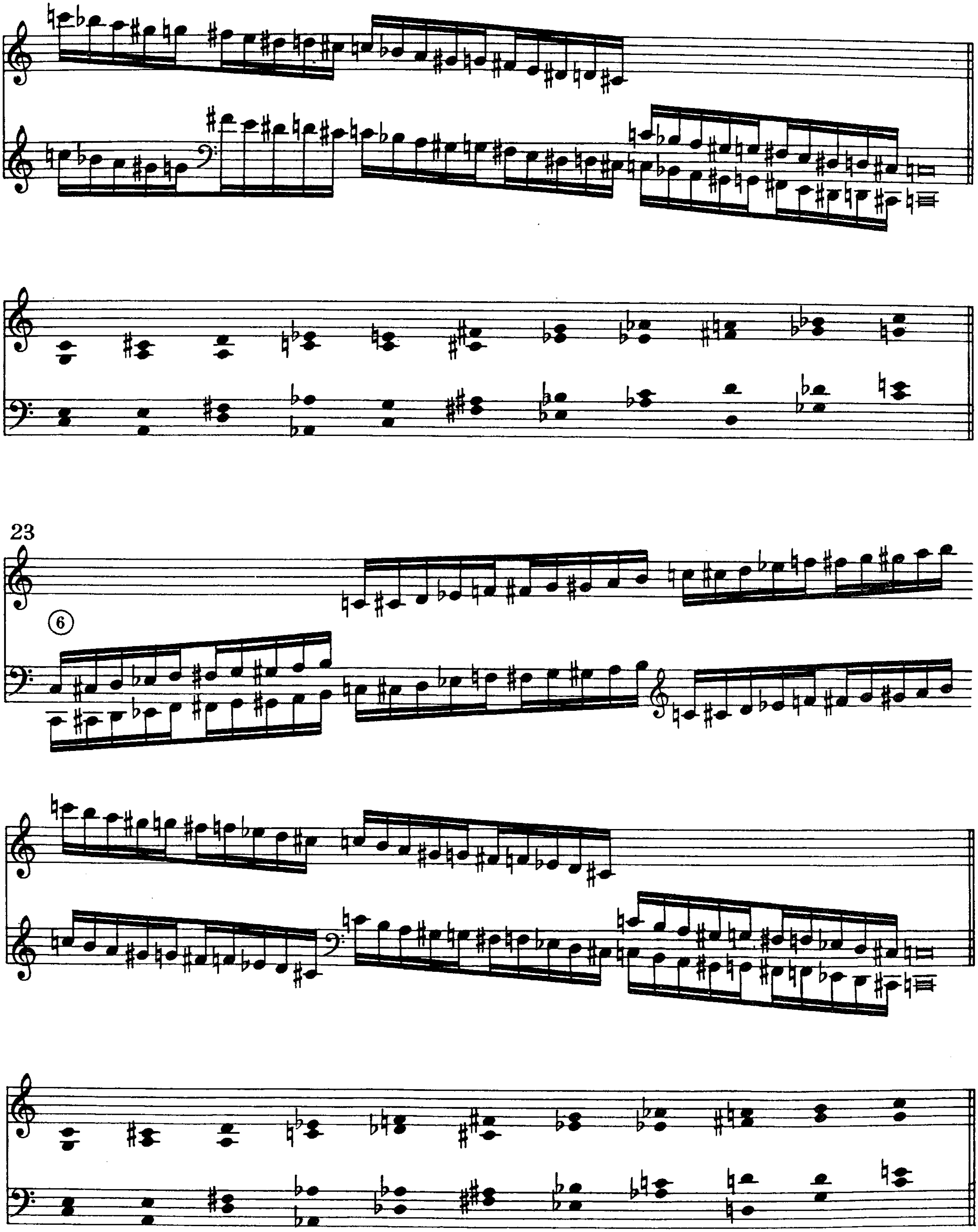



15
1 7
16
5 11
17
6 12


18
⑩
19
③⑨
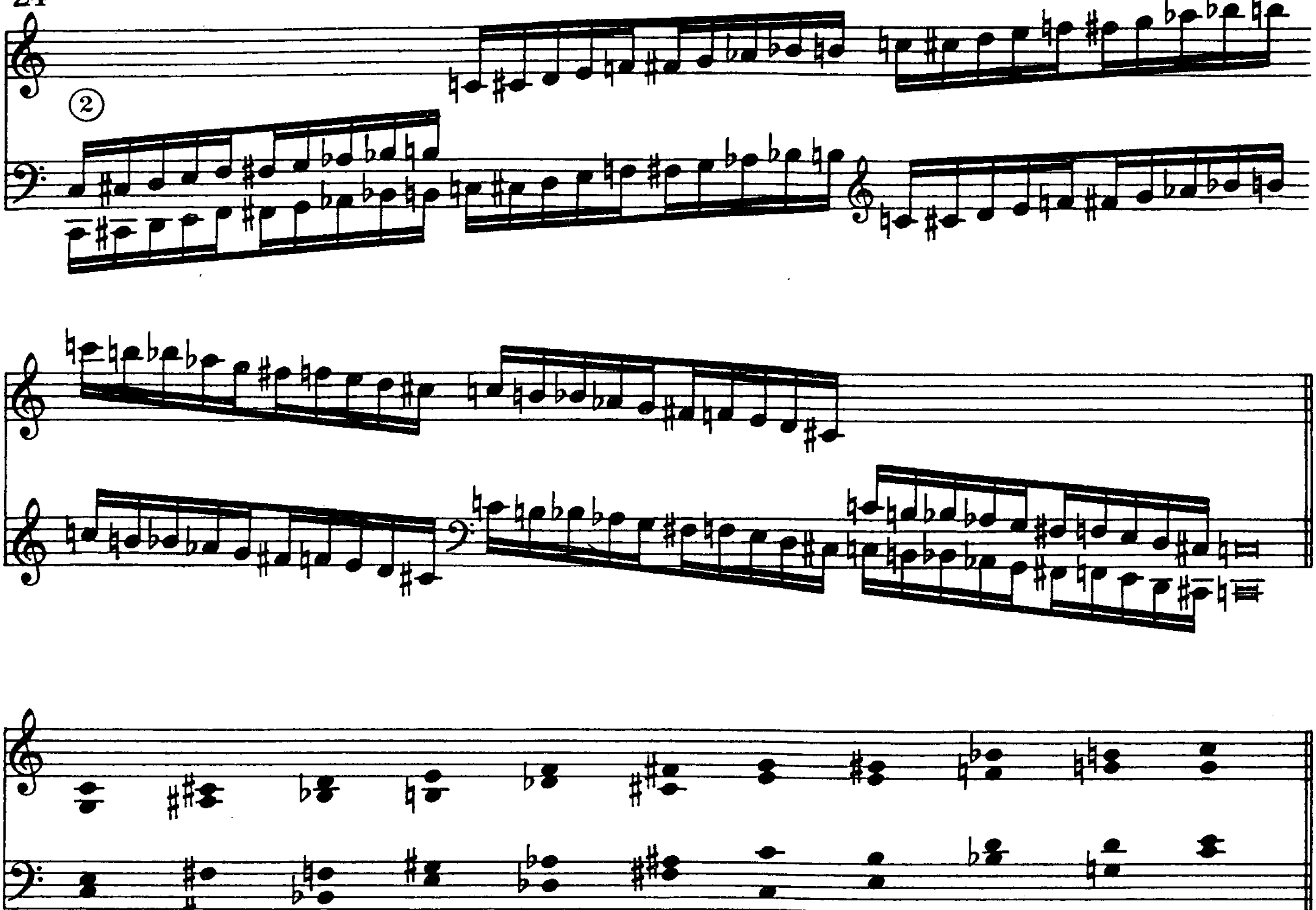


## Interpolation of Four Notes
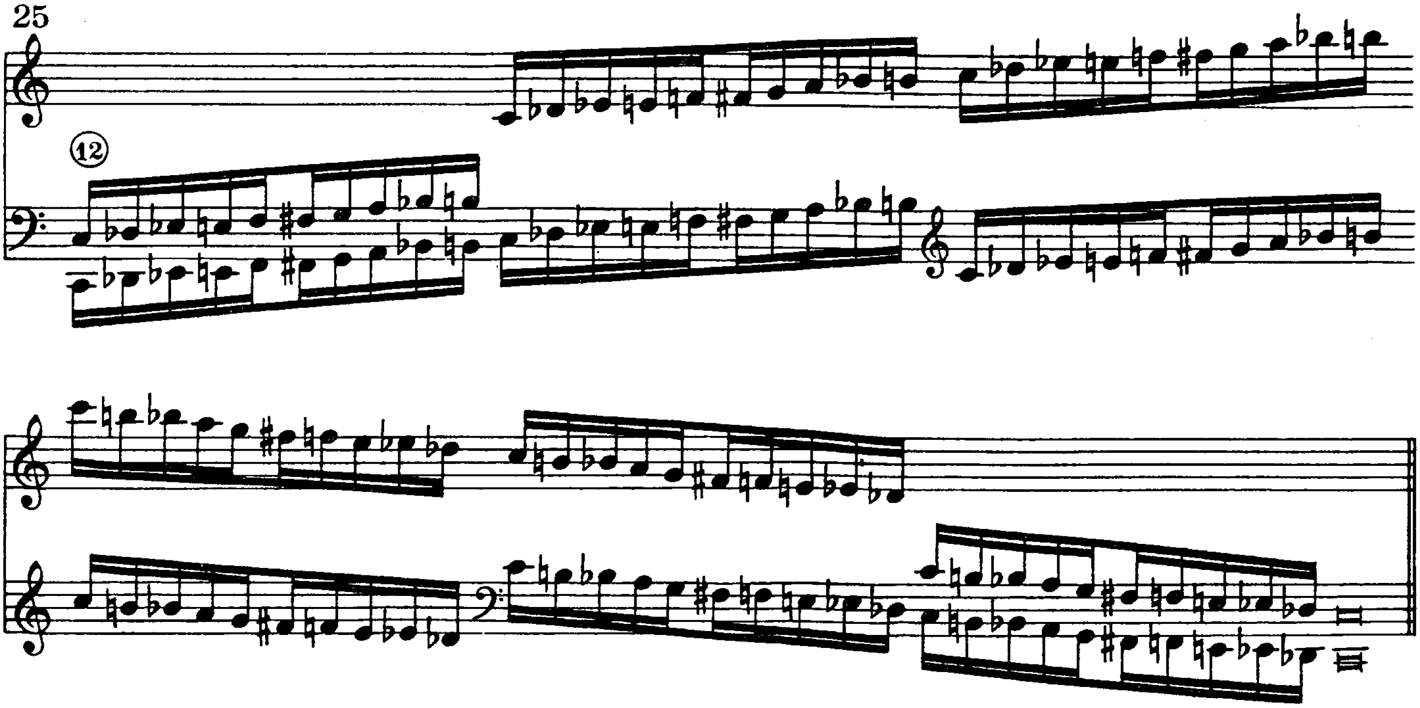


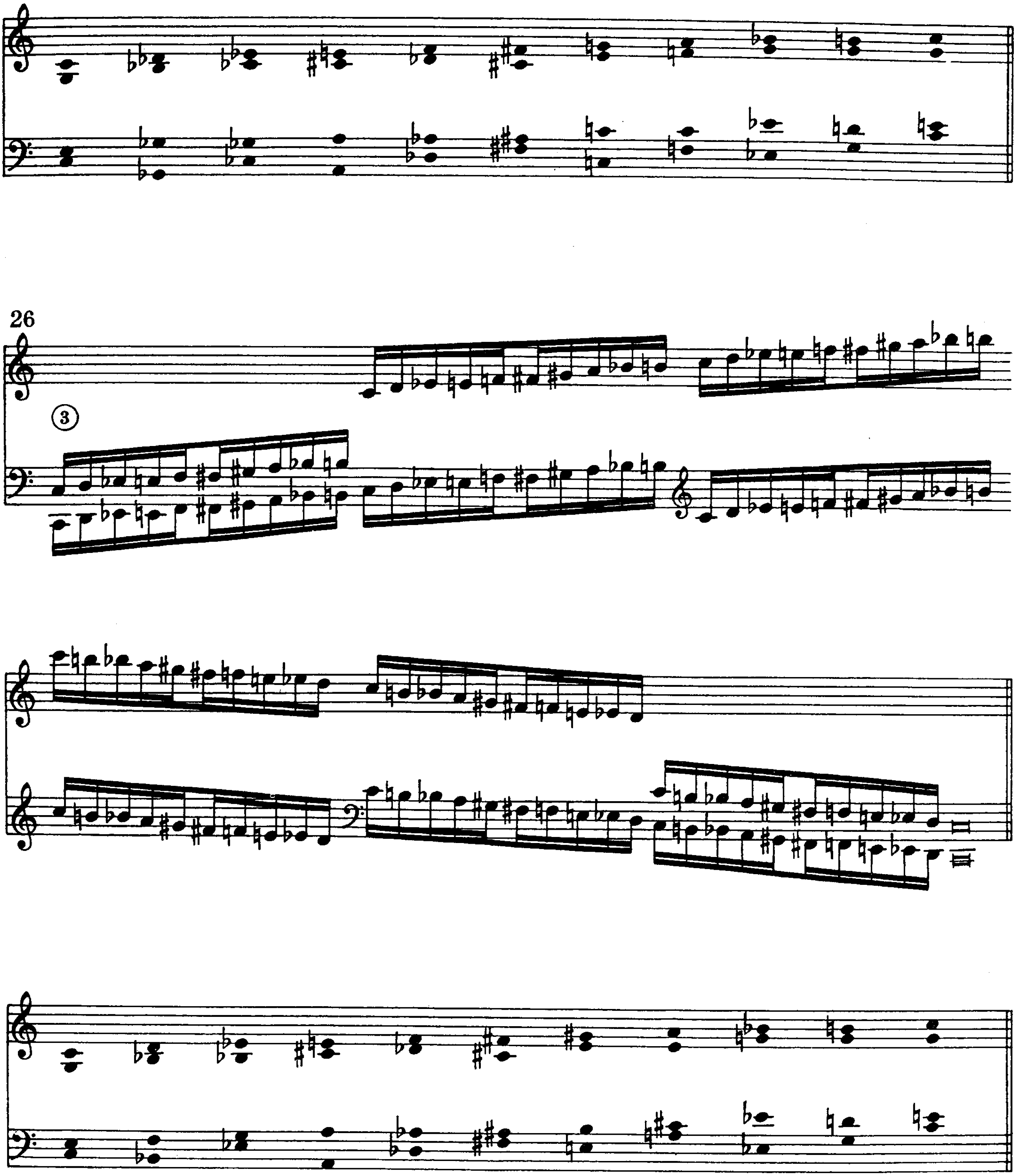

23
6

24
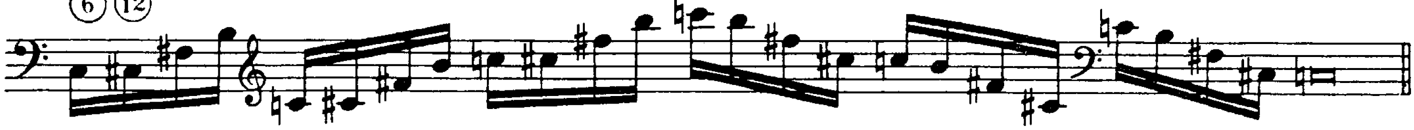



25
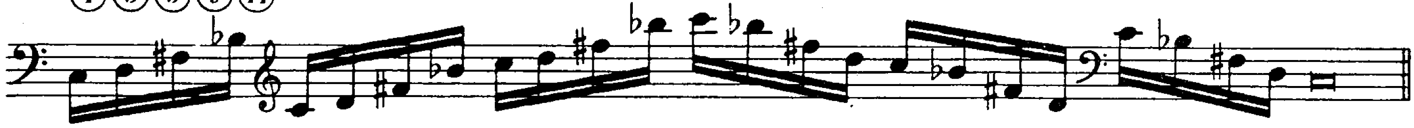



26
3

## Symmetric Interpolation of One Note

27 ⑥⑫



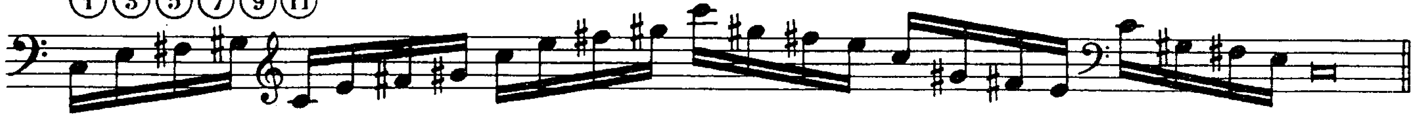
28 ①③⑤⑨⑪



29 ③⑥⑨⑫



30 ①③⑤⑦⑨⑪
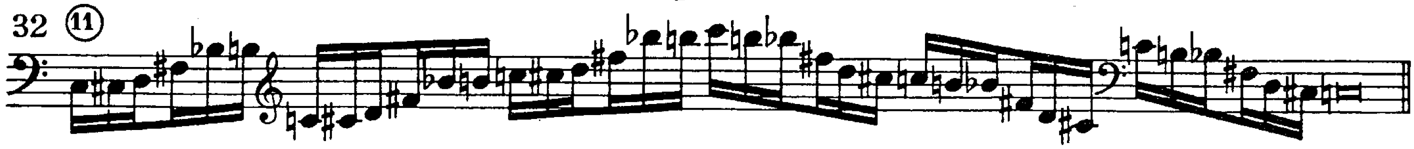


31 ⑥⑫
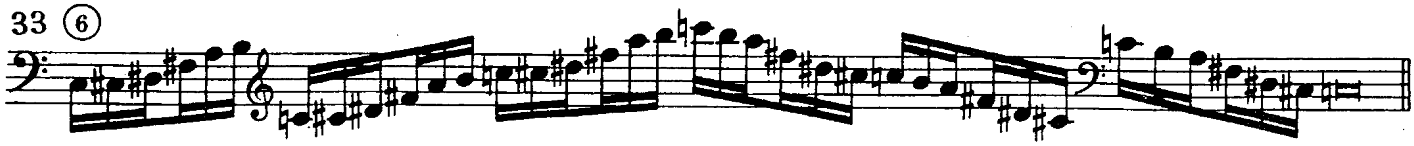


## Symmetric Interpolation of Two Notes

32 ⑪



33 ⑥



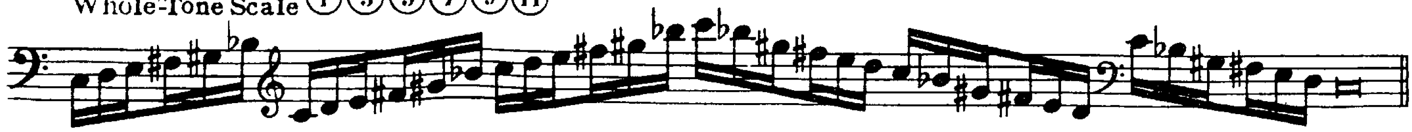
34 ⑪
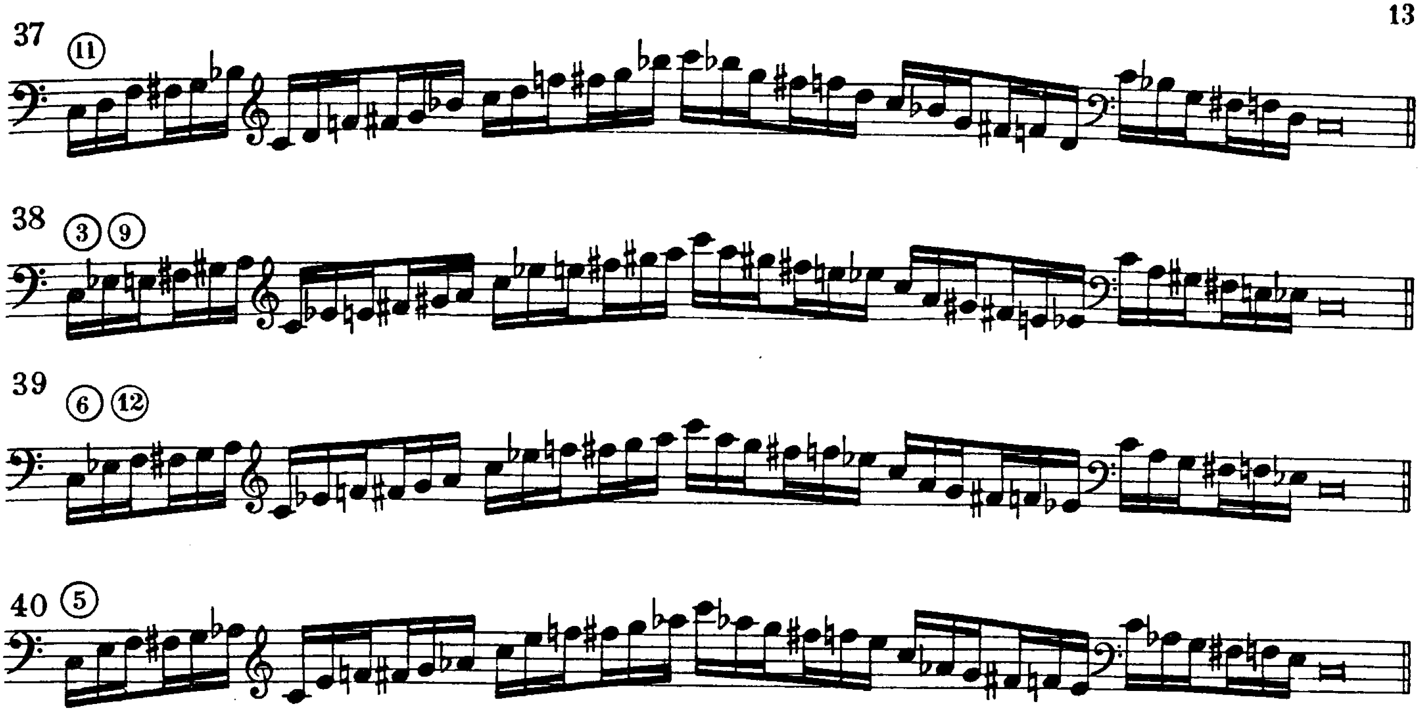


35 ③⑨
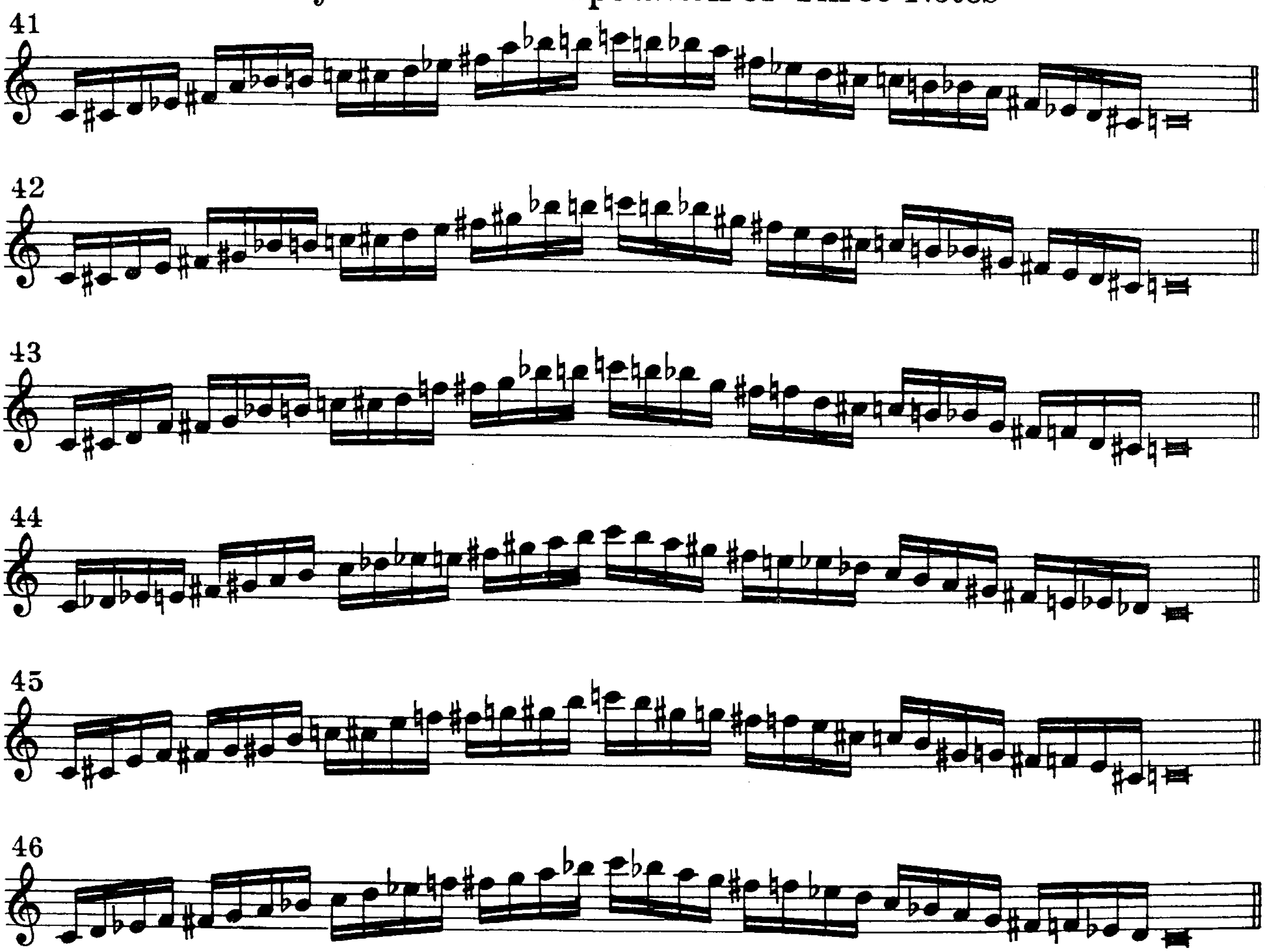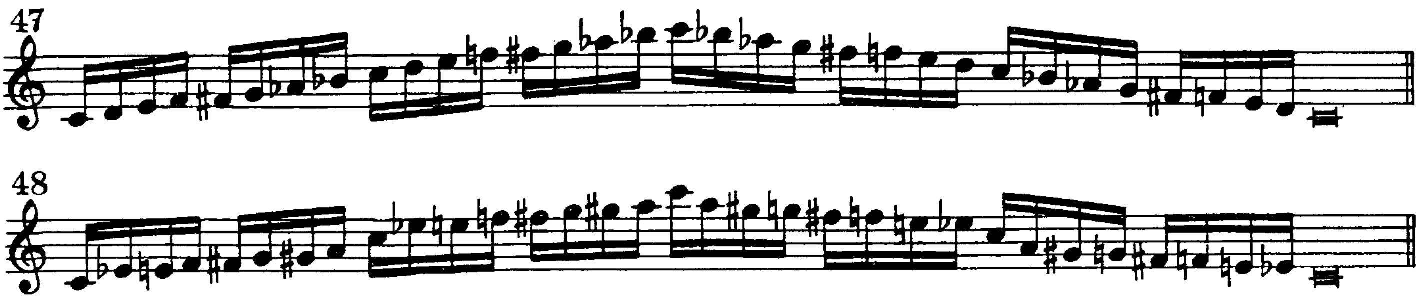


36 Whole-Tone Scale ①③⑤⑦⑨⑪
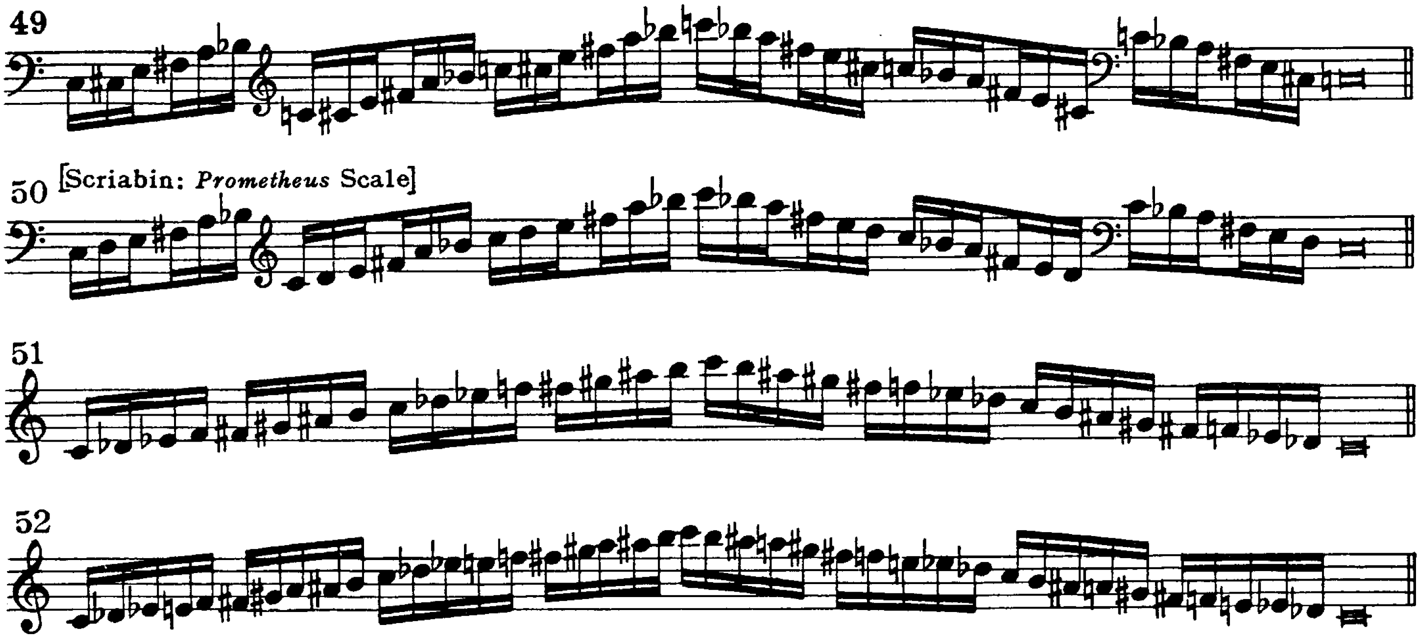





## Symmetric Interpolation of Three Notes
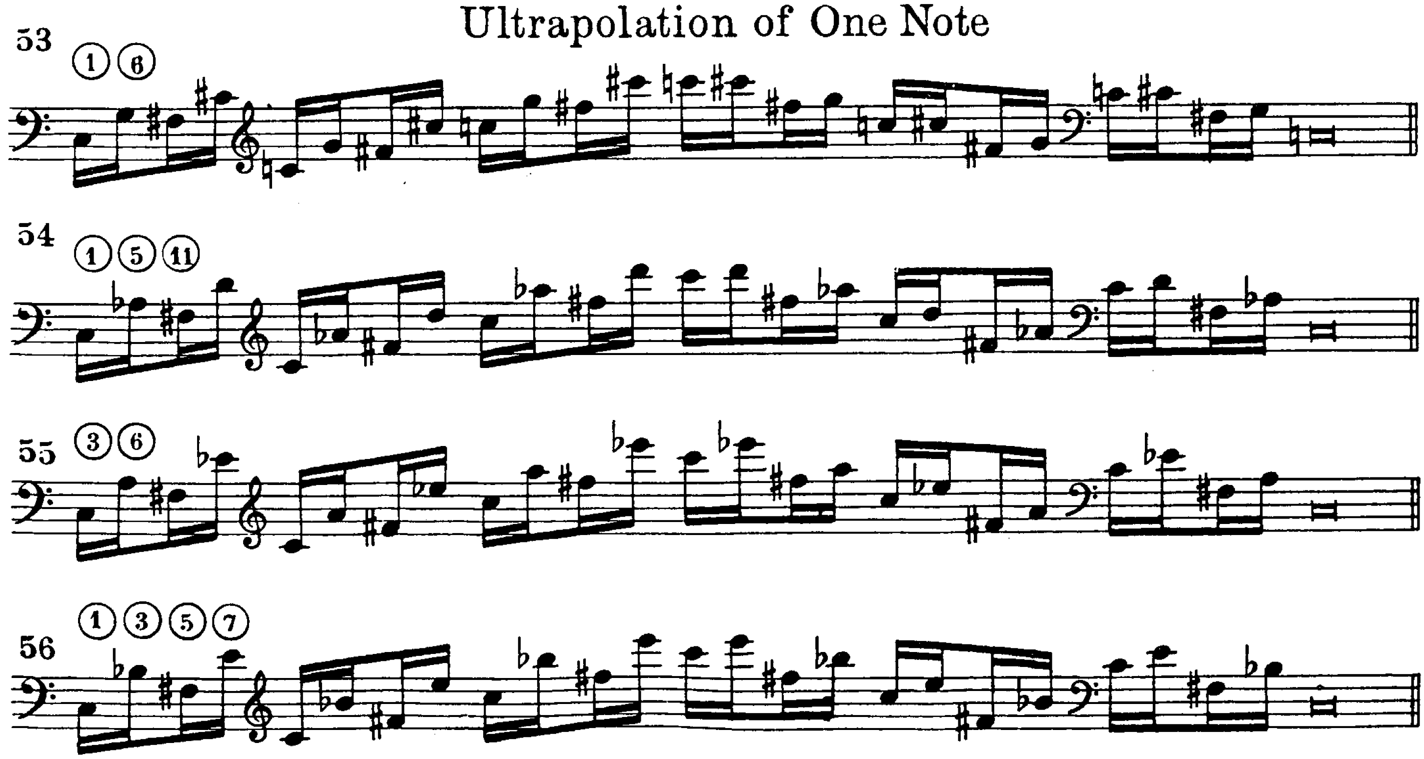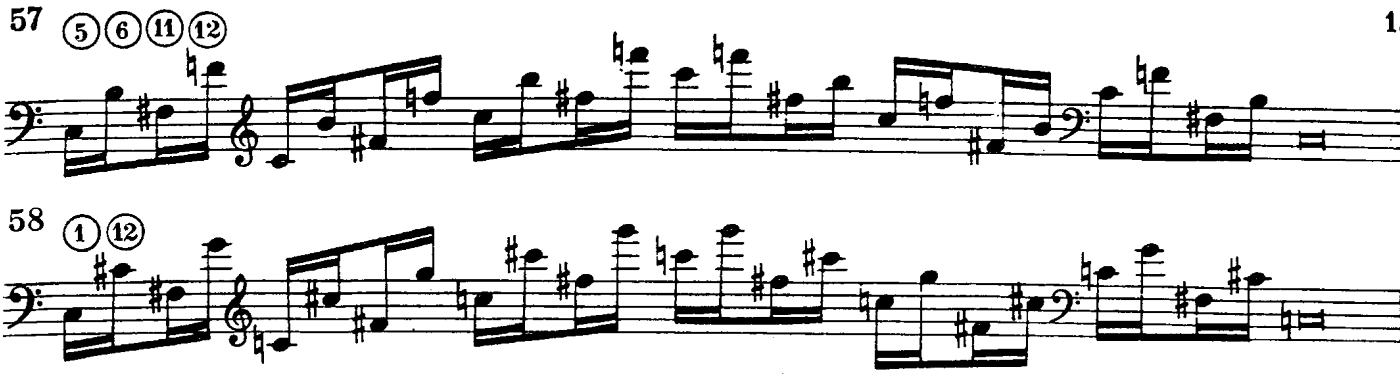





## Non-Symmetric Interpolation
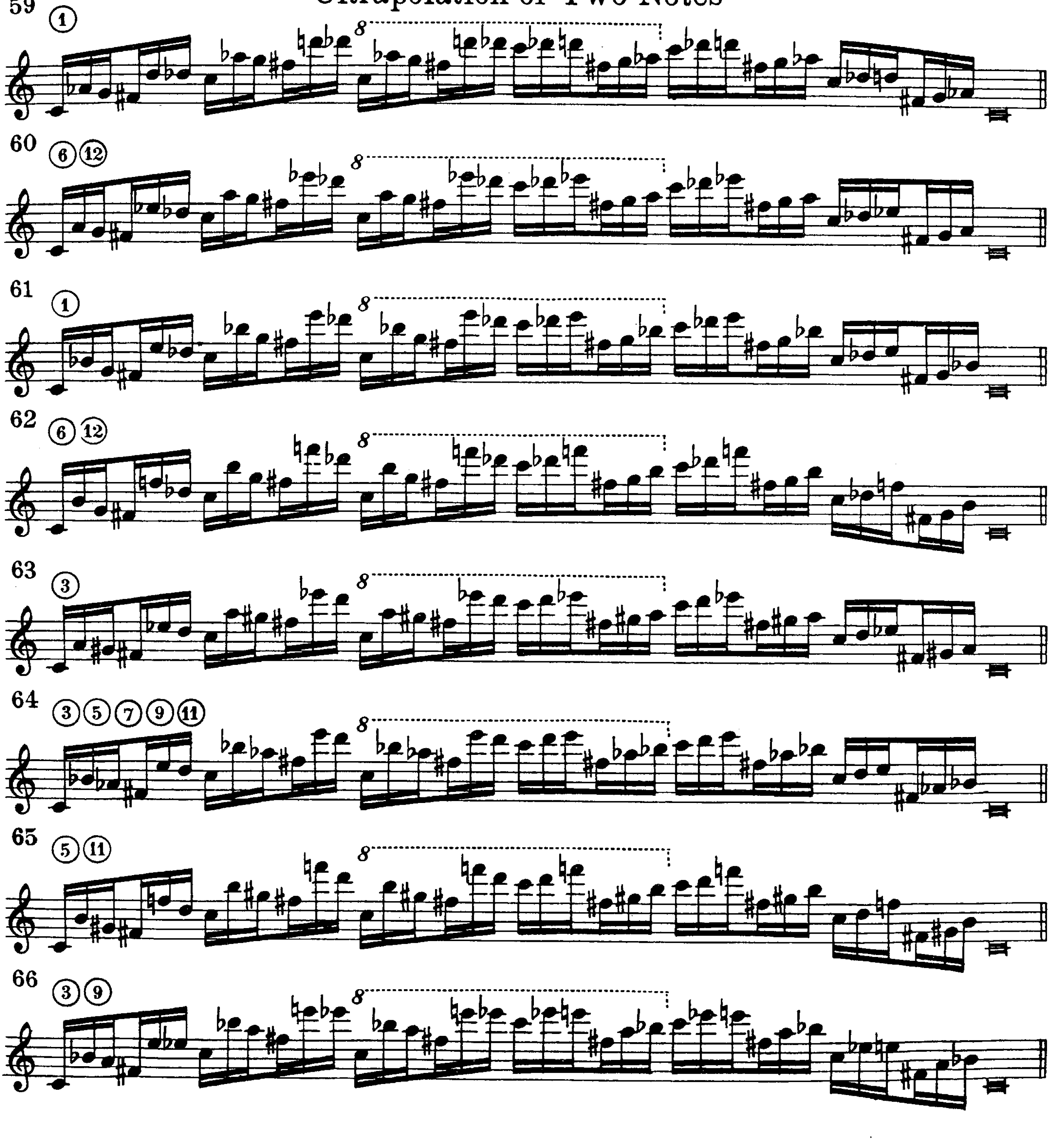


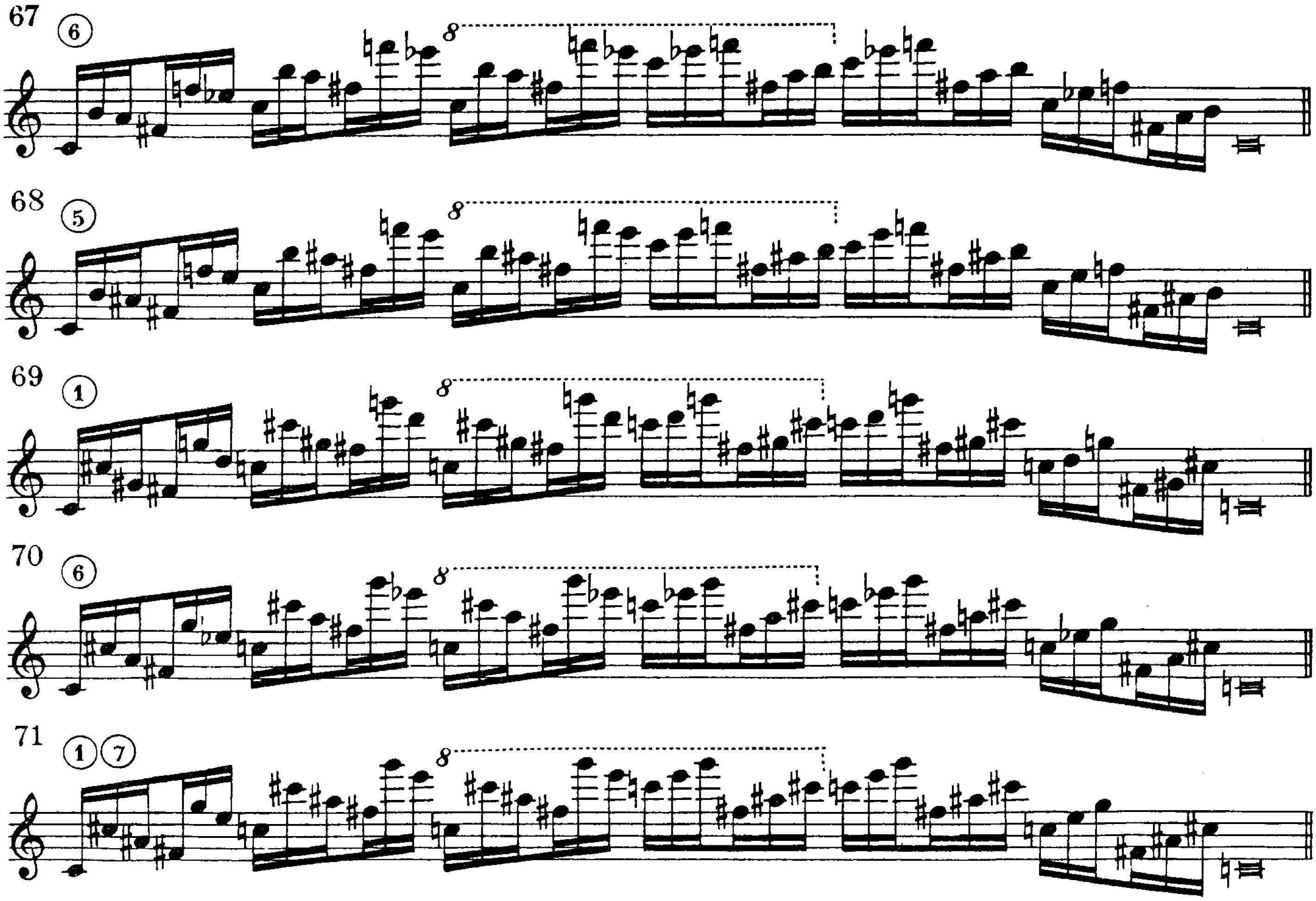

## Ultrapolation of One Note
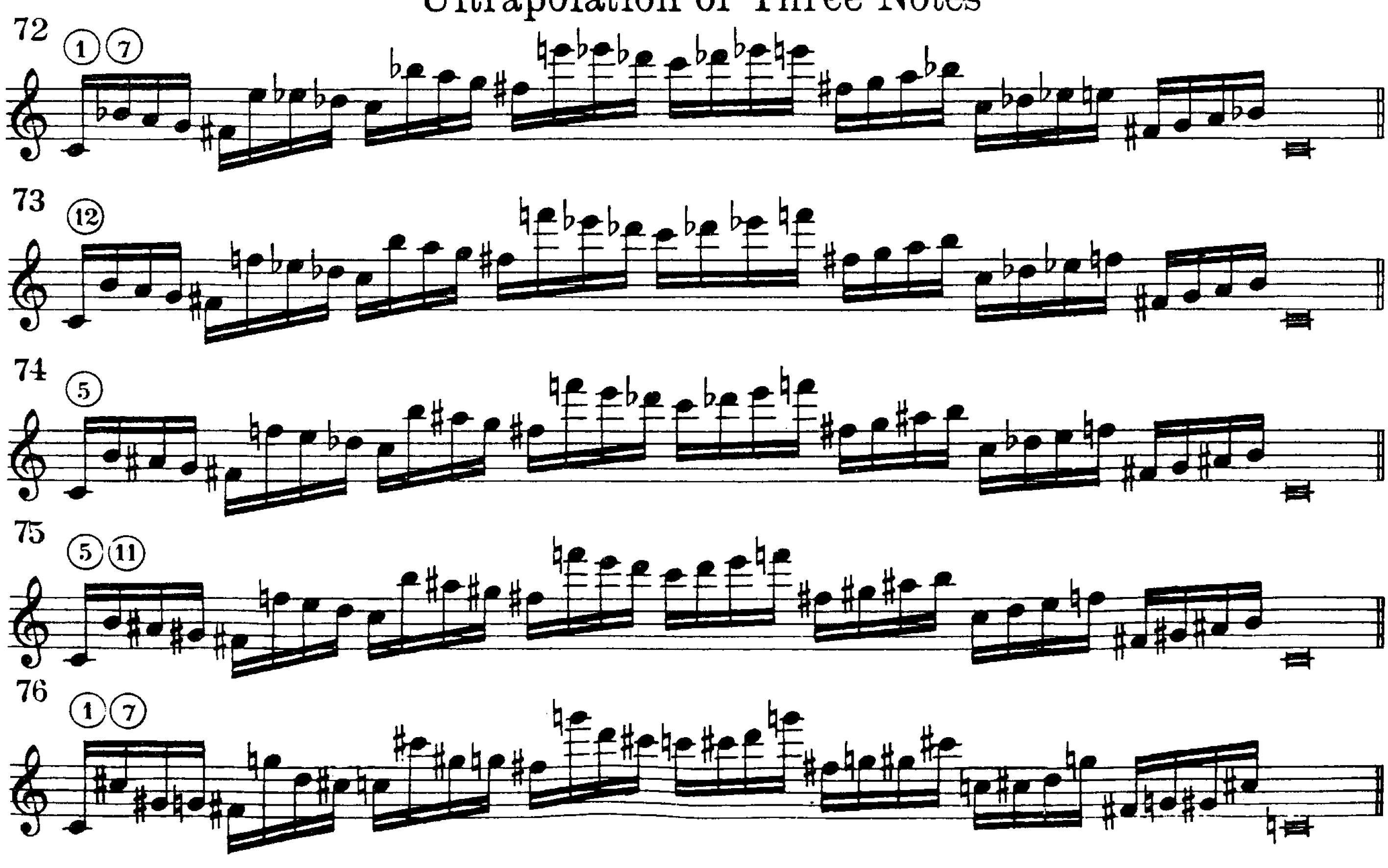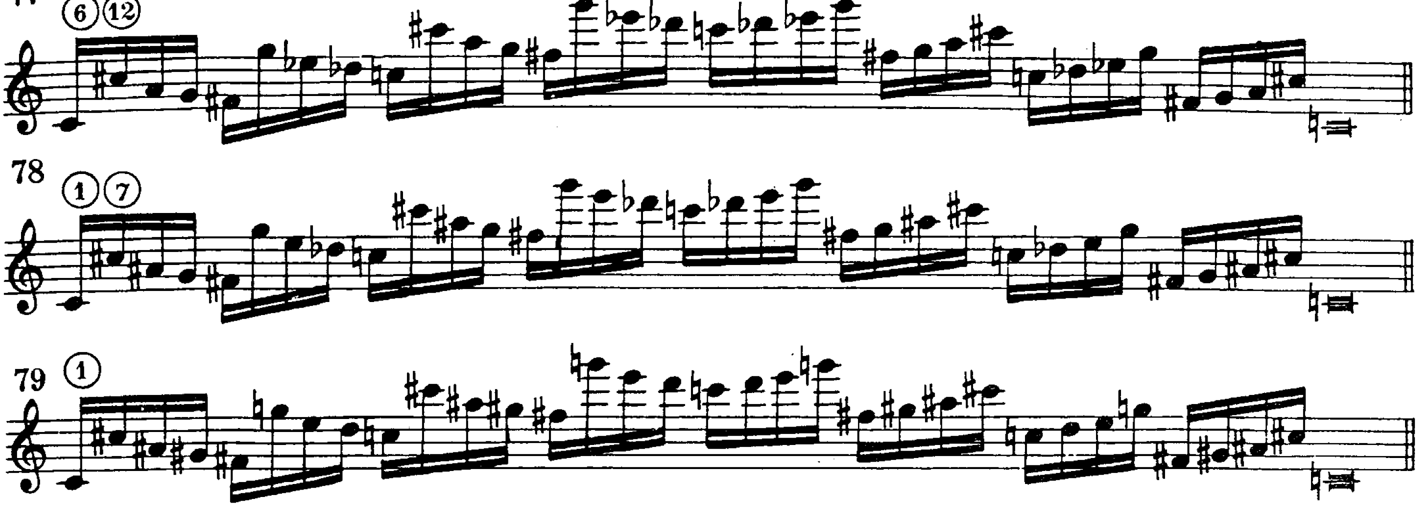





## Ultrapolation of Two Notes
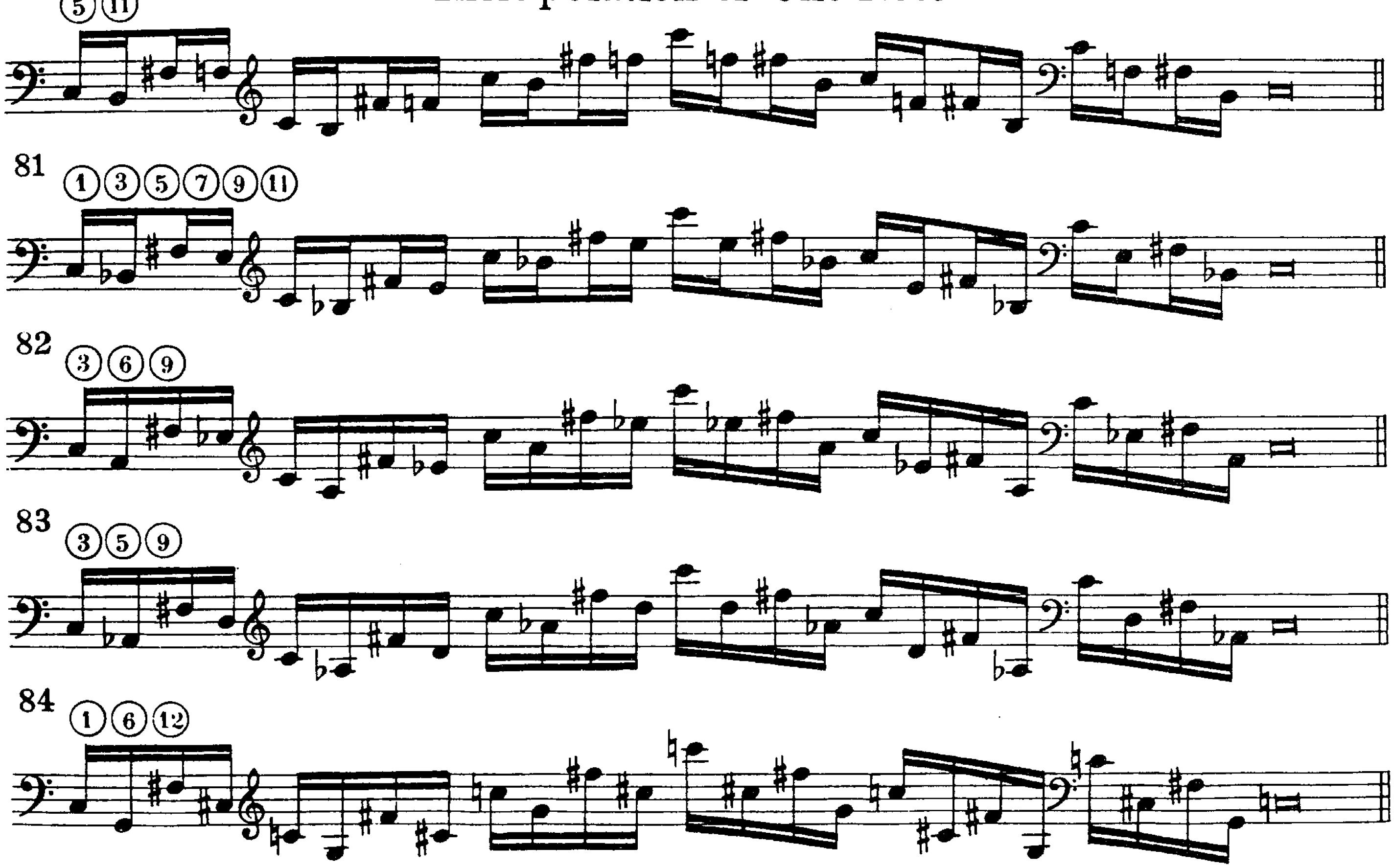





## Ultrapolation of Three Notes
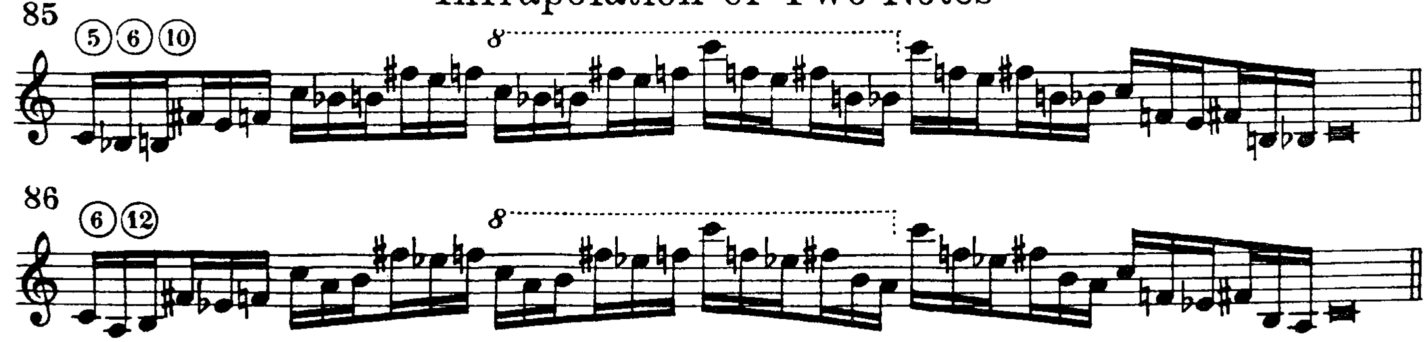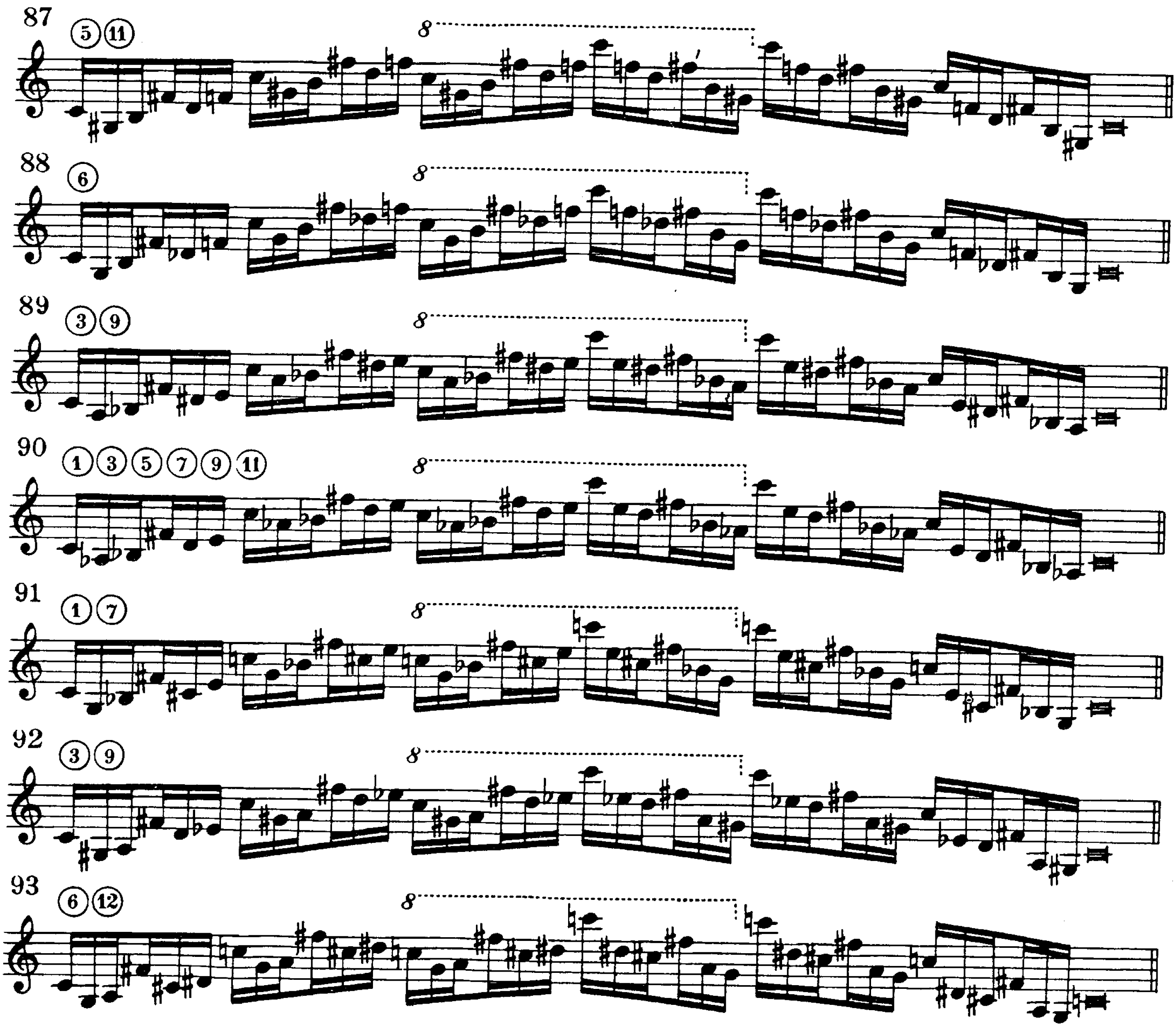





## Infrapolation of One Note
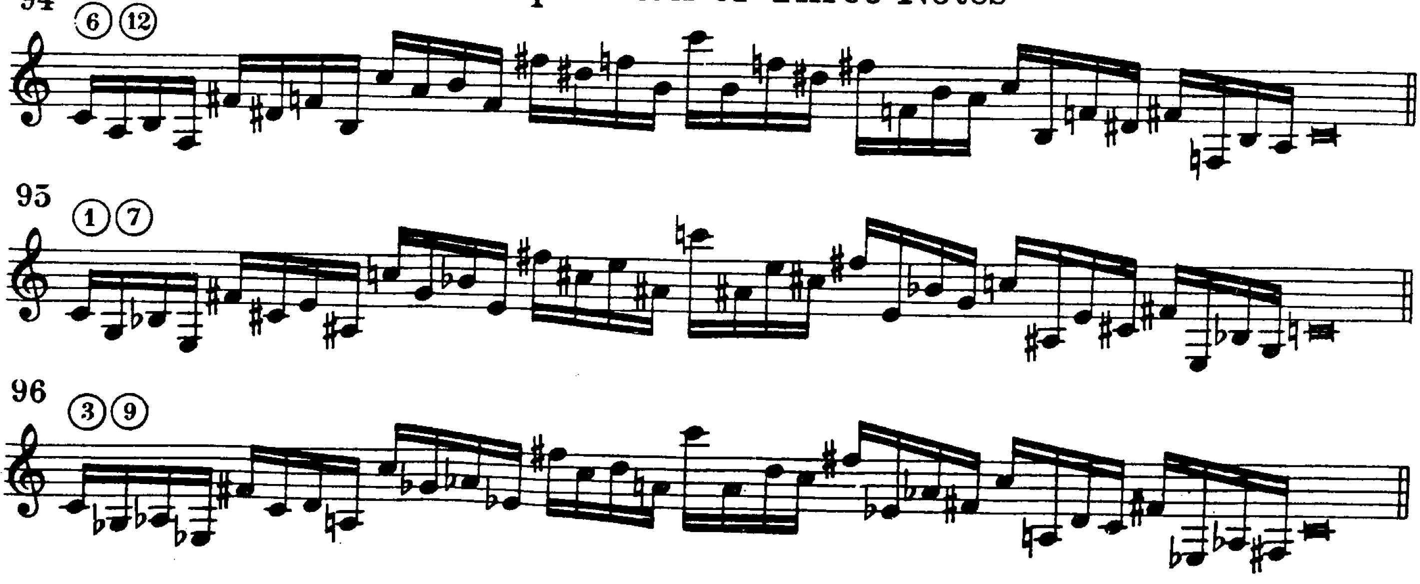



## Infrapolation of Two Notes

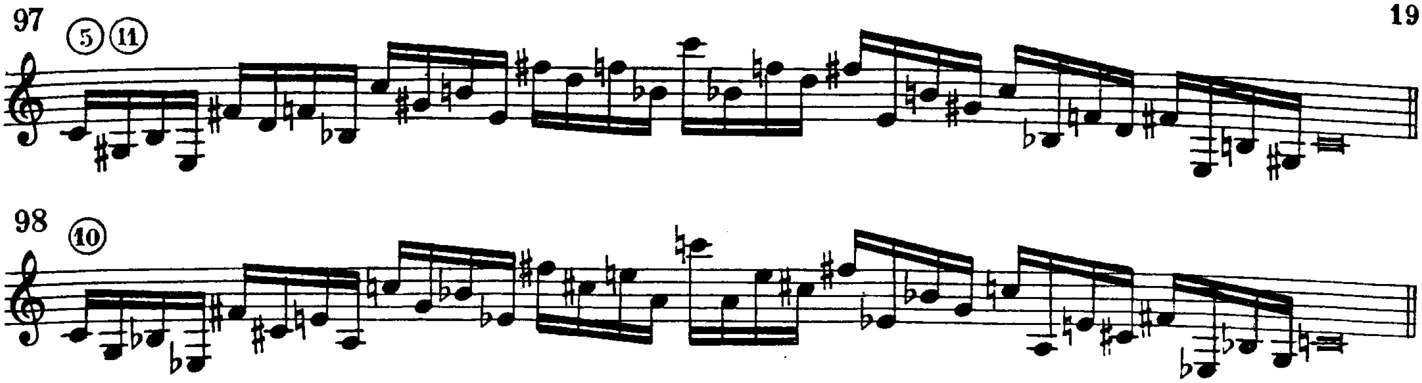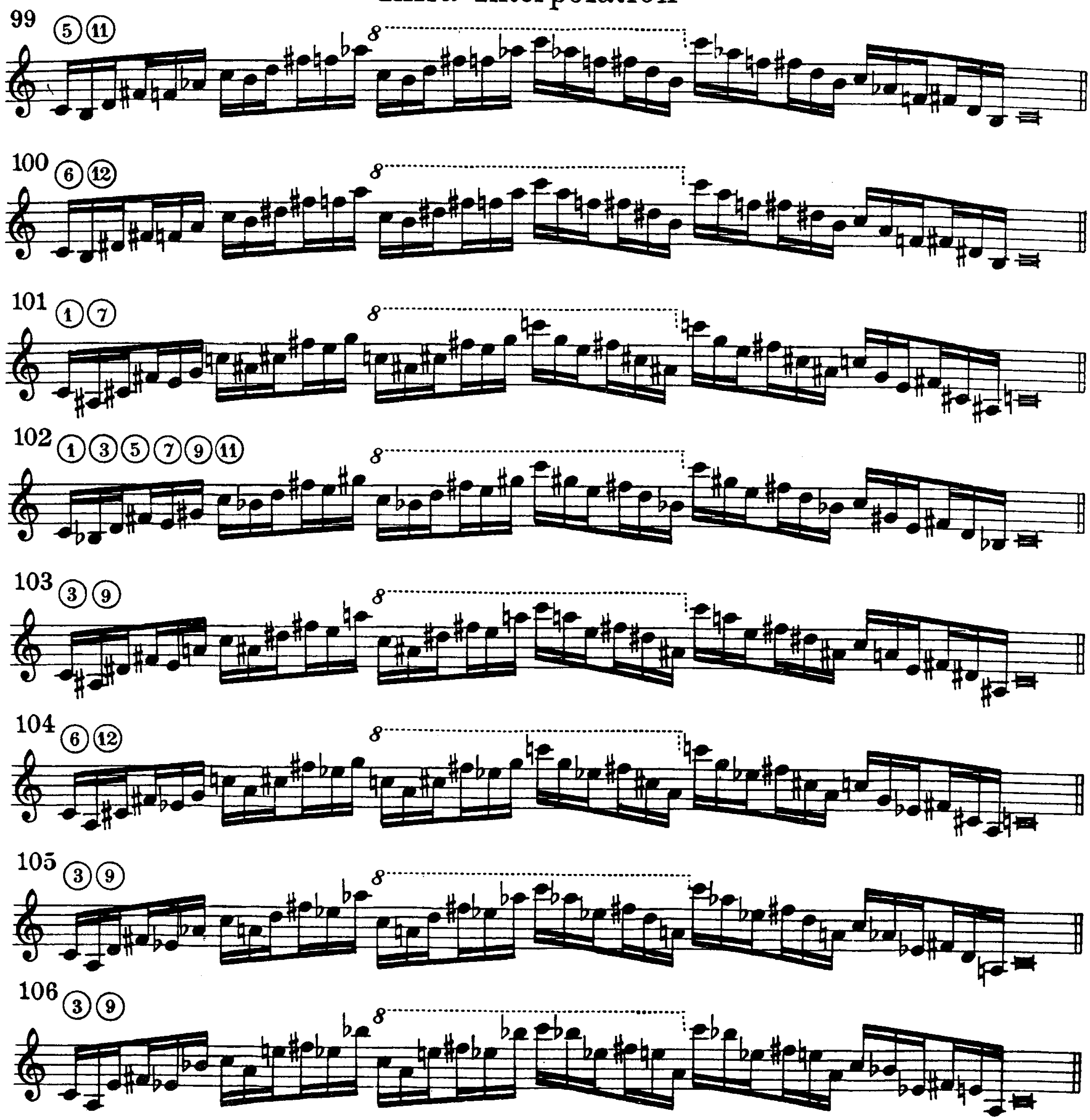





## Infrapolation of Three Notes

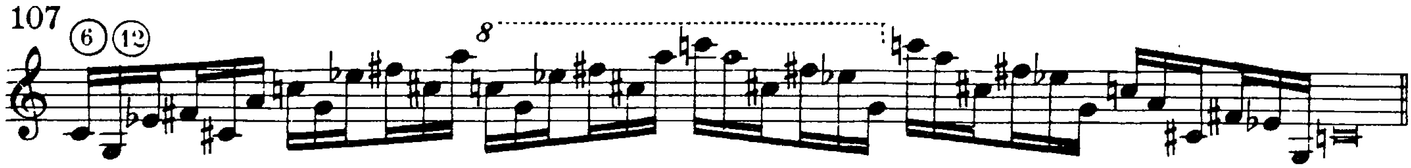
94



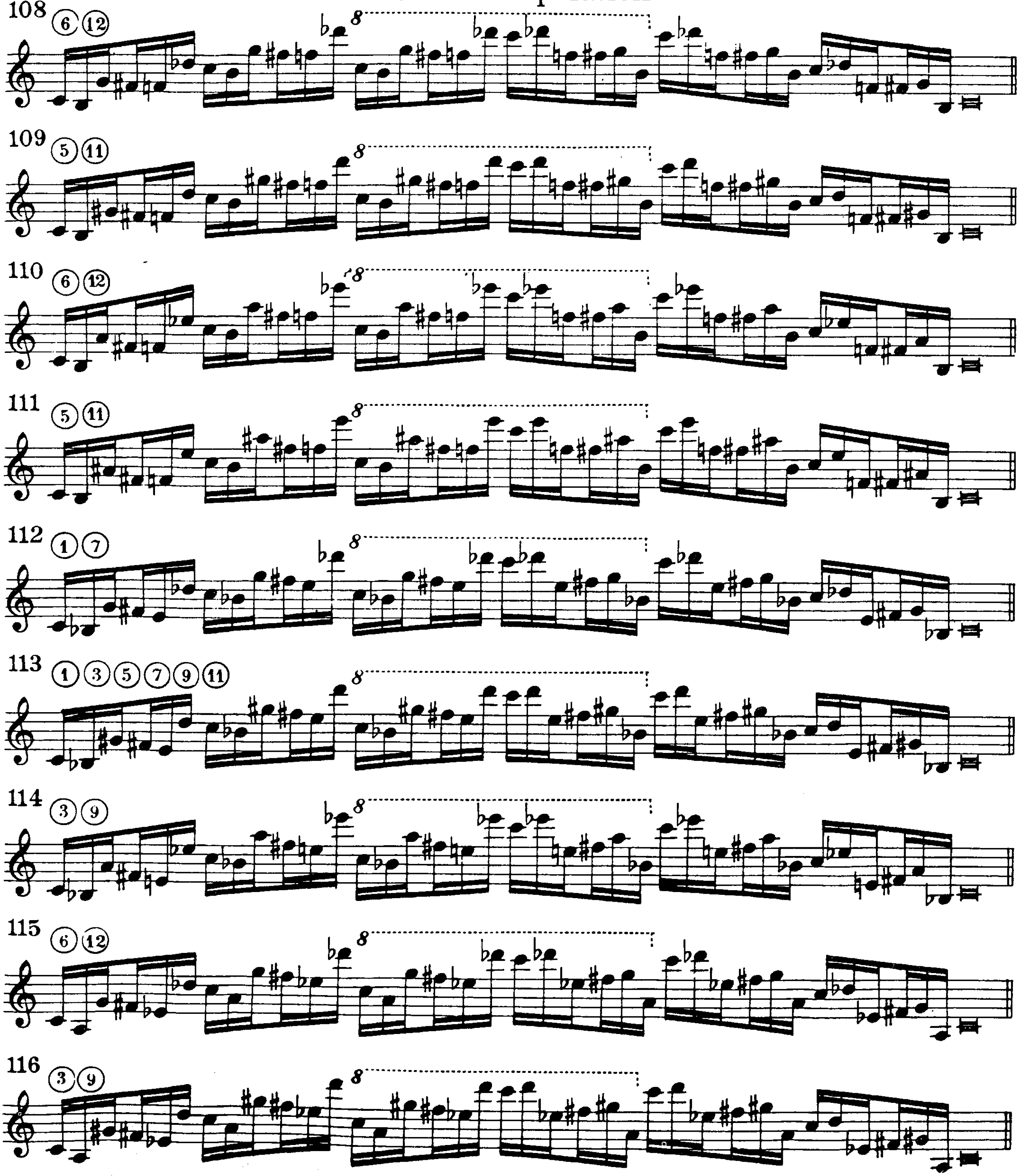


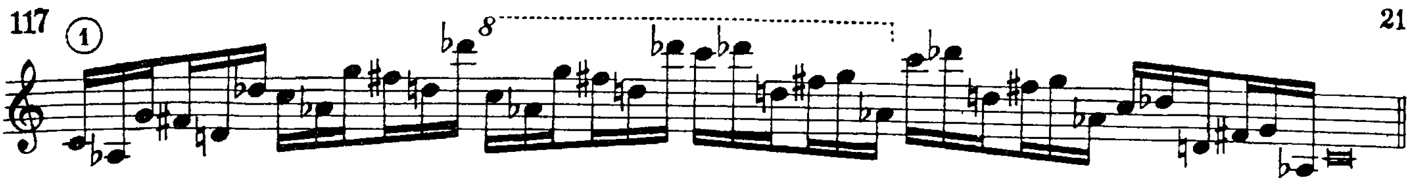

## Infra-Interpolation



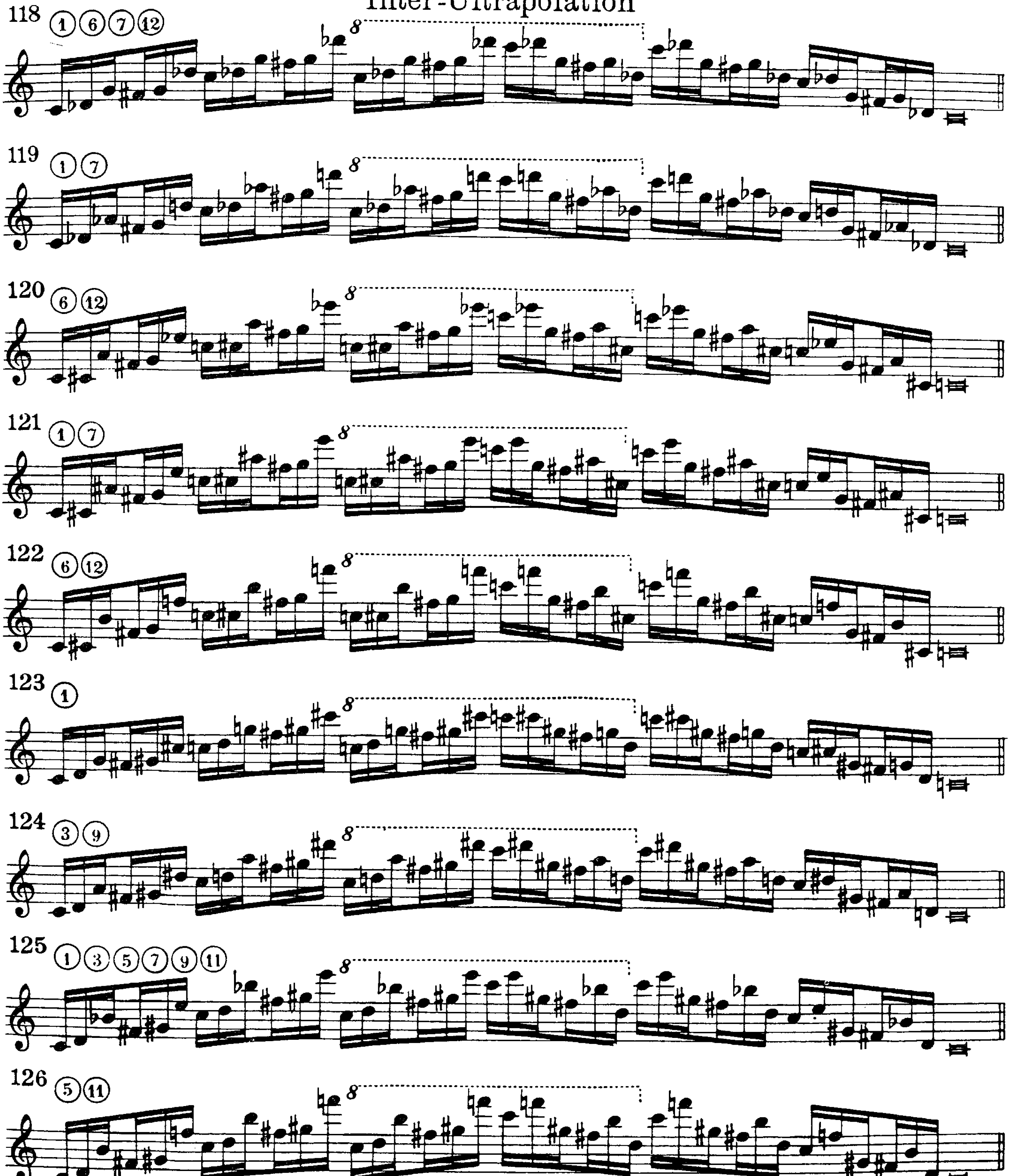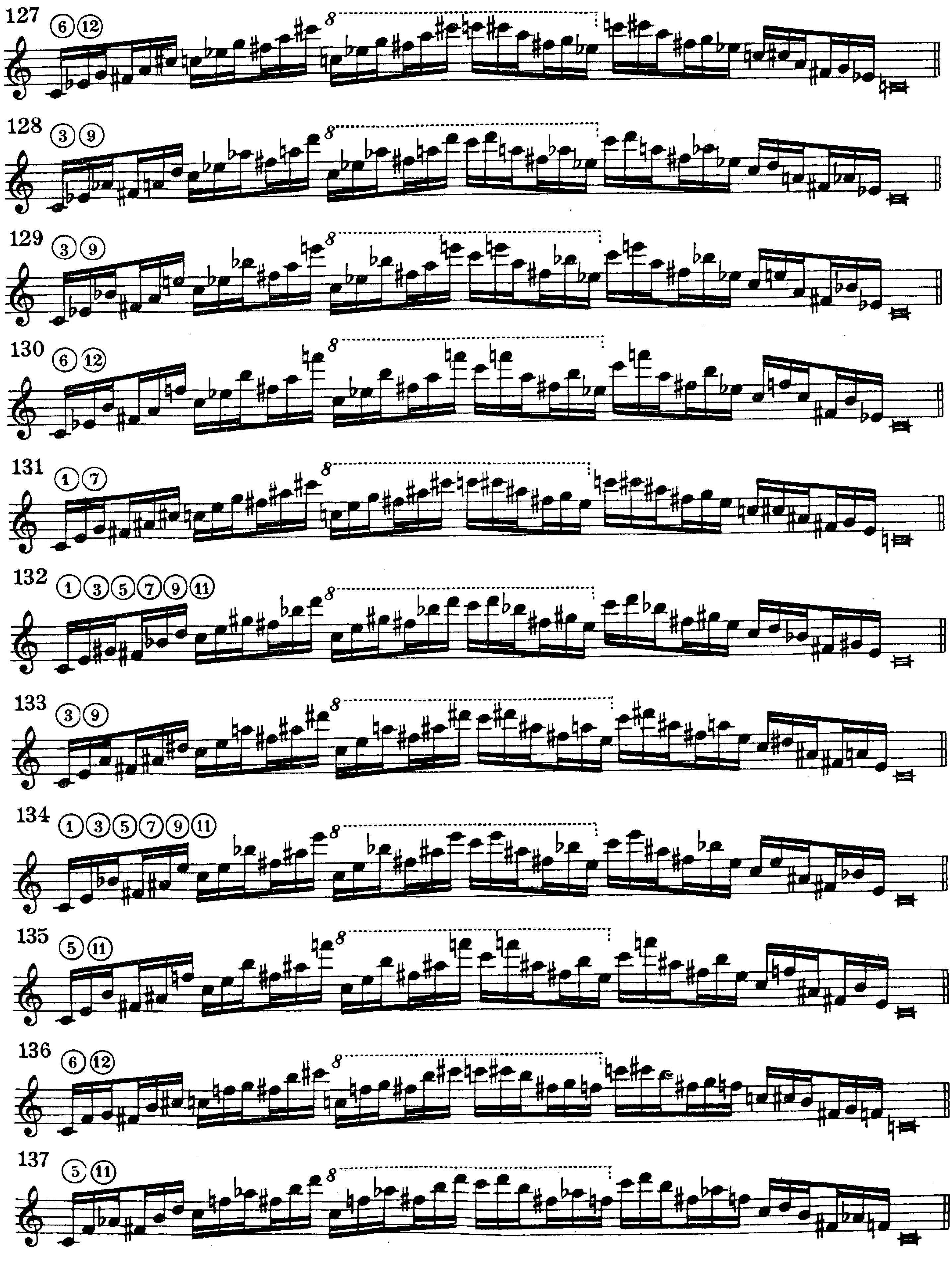



## Infra-Ultrapolation

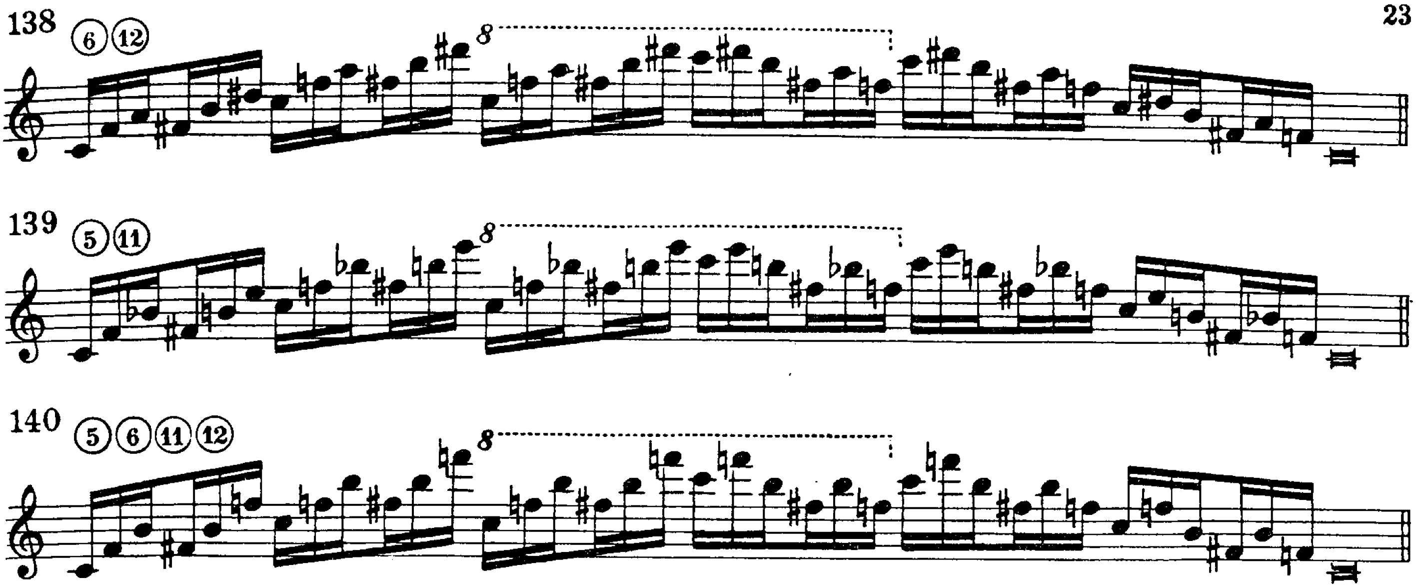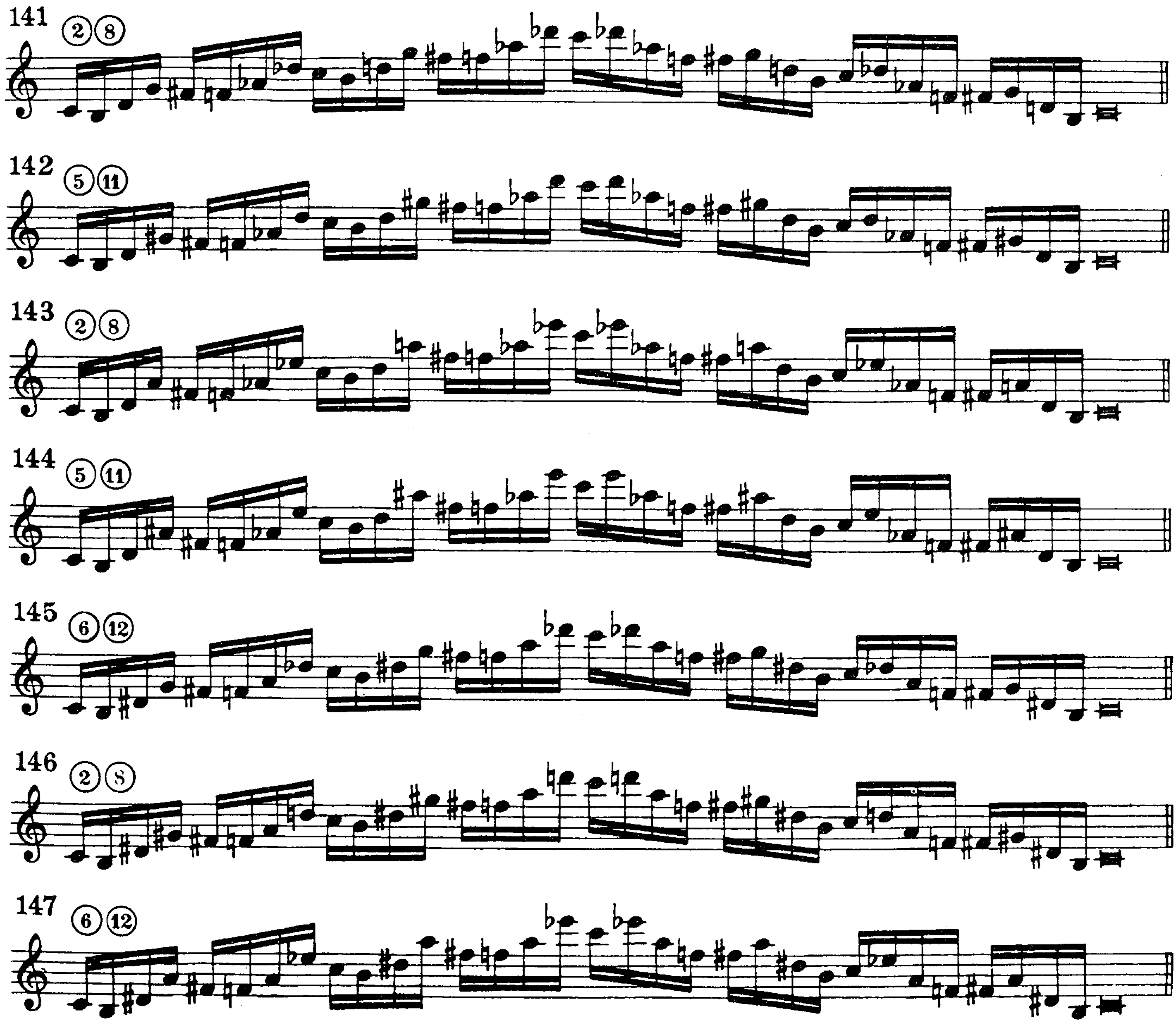





## Inter-Ultrapolation
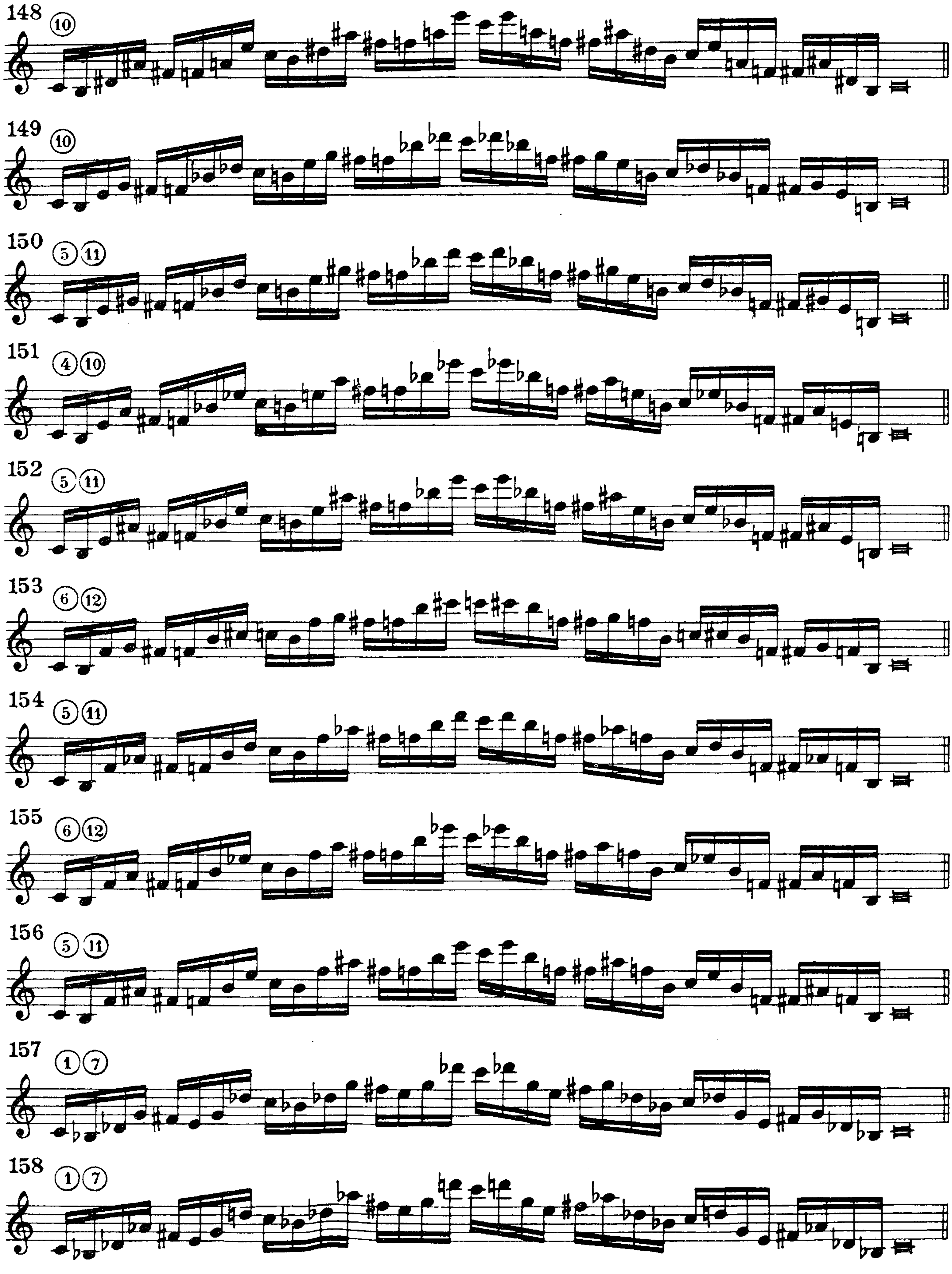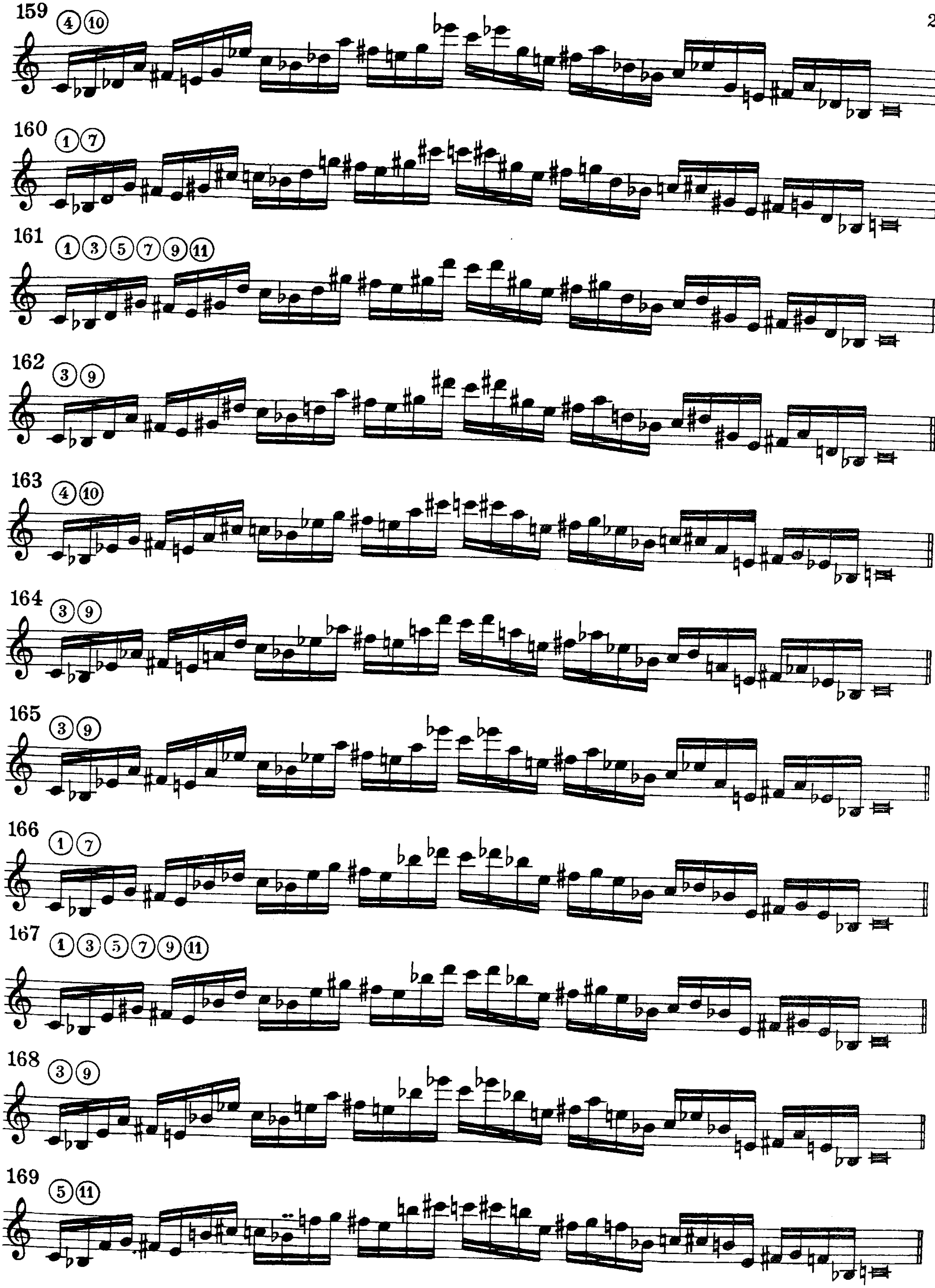



127 ⑥⑫
128 ③⑨
129 ③⑨
130 ⑥⑫
131 ①⑦
132 ①③⑤⑦⑨⑪
133 ③⑨
134 ①③⑤⑦⑨⑪
135 ⑤⑪
136 ⑥⑫
137 ⑤⑪

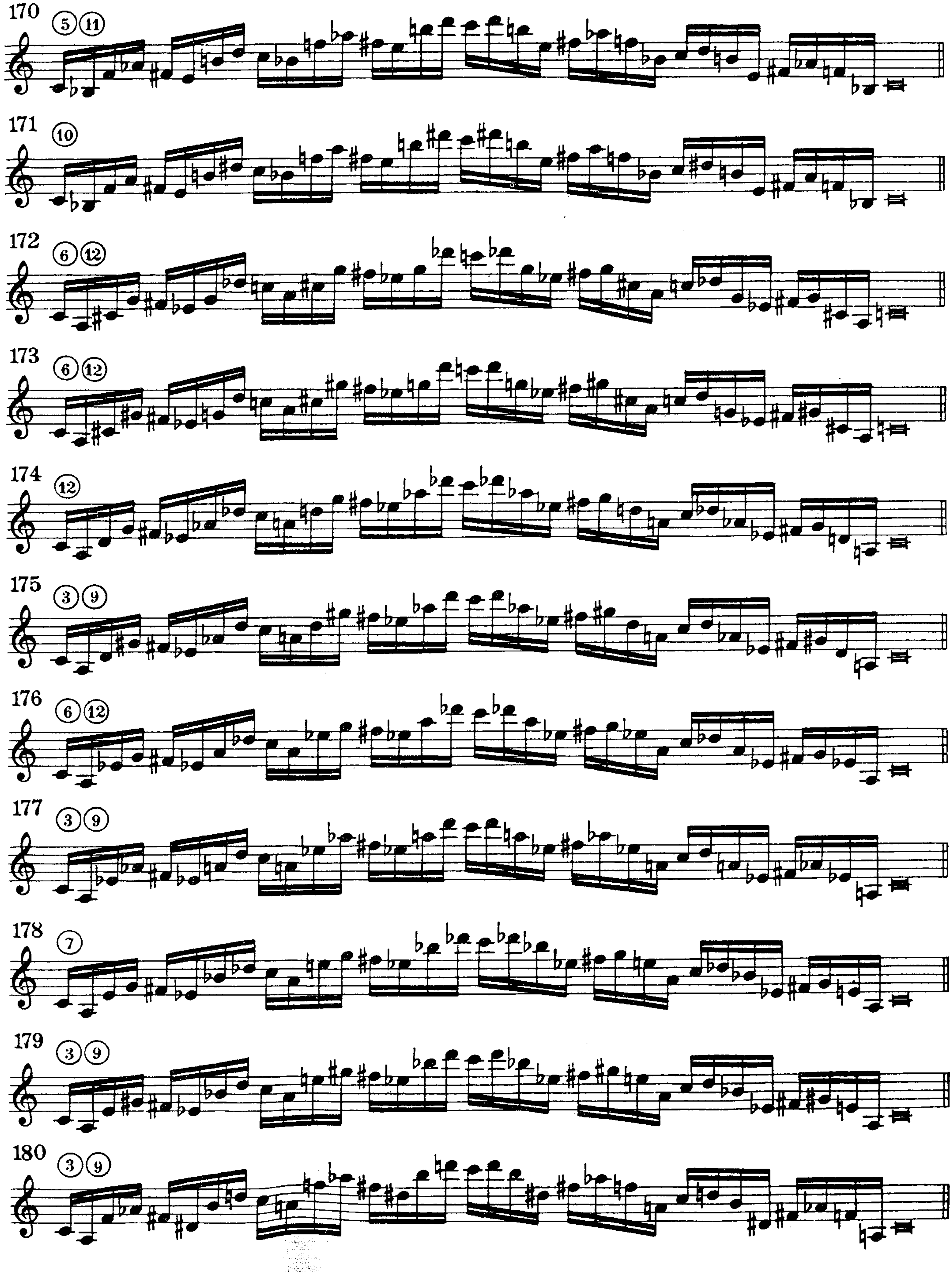



## Infra-Inter-Ultrapolation
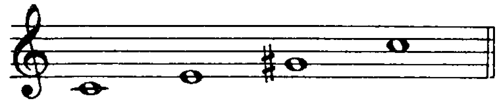



148 ⑩
149 ⑩
150 ⑤⑪
151 ④⑩
152 ⑤⑪
153 ⑥⑫
154 ⑤⑪
155 ⑥⑫
156 ⑤⑪
157 ①⑦
158 ①⑦


159 ④⑩
160 ①⑦
161 ①③⑤⑦⑨⑪
162 ③⑨
163 ④⑩
164 ③⑨
165 ③⑨
166 ①⑦
167 ①③⑤⑦⑨⑪
168 ③⑨
169 ⑤⑪


170 ⑤ ⑪
171 ⑩
172 ⑥ ⑫
173 ⑥ ⑫
174 ⑫
175 ③ ⑨
176 ⑥ ⑫
177 ③ ⑨
178 ⑦
179 ③ ⑨
180 ③ ⑨
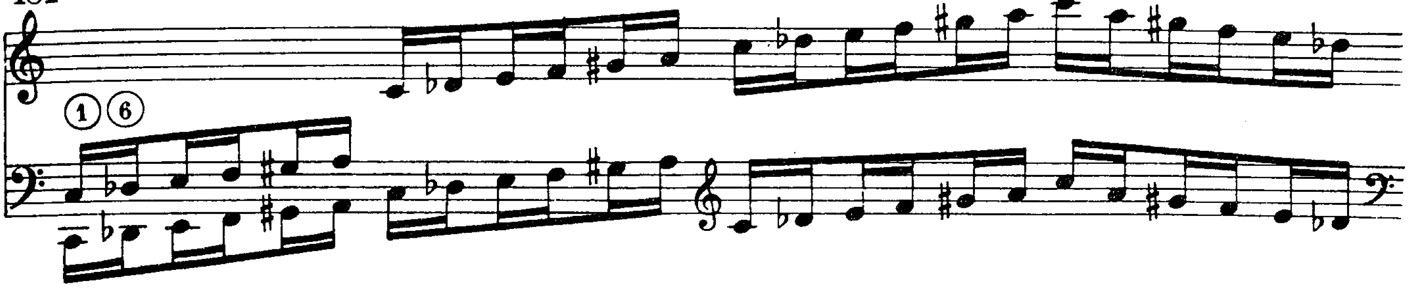
# Ditone Progression
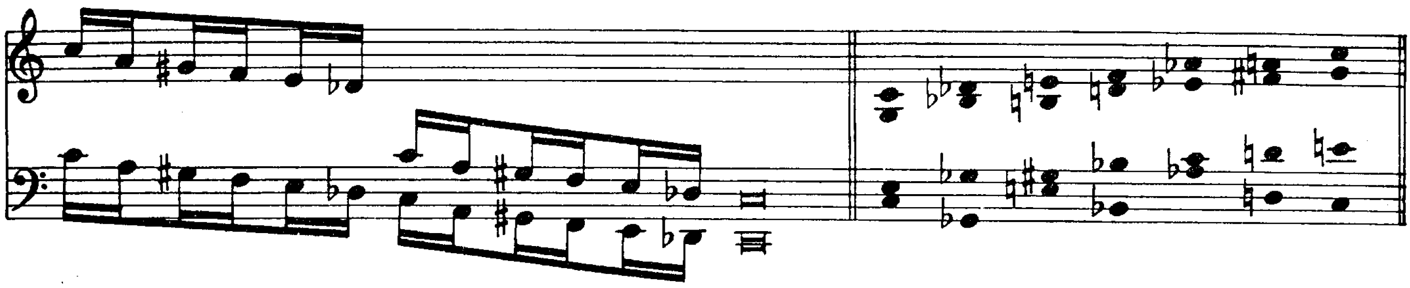
## Equal Division of One Octave into Three Parts
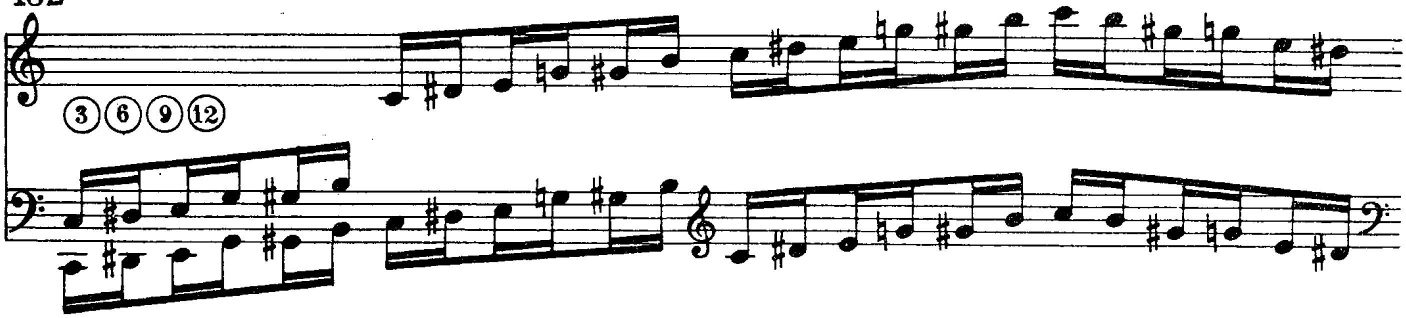


### Interpolation of One Note

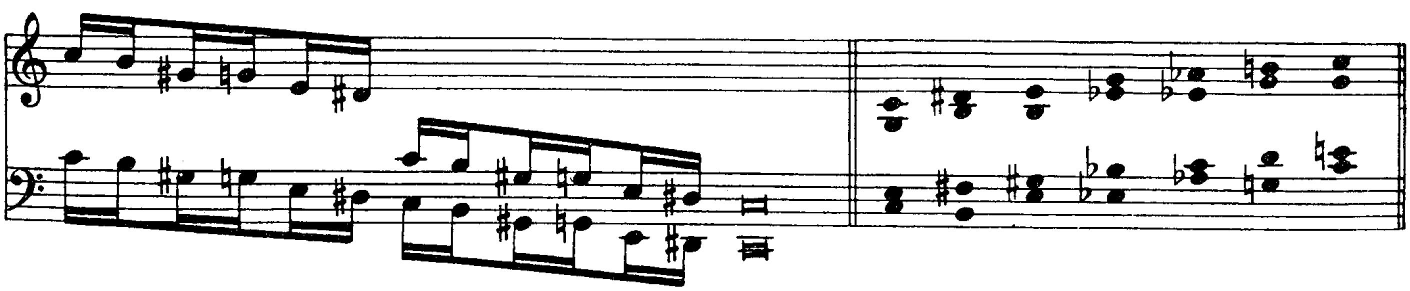
181
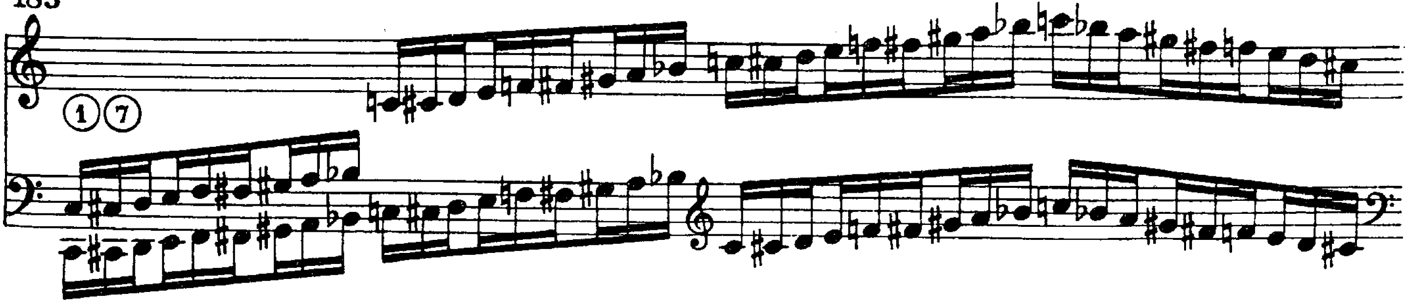




182
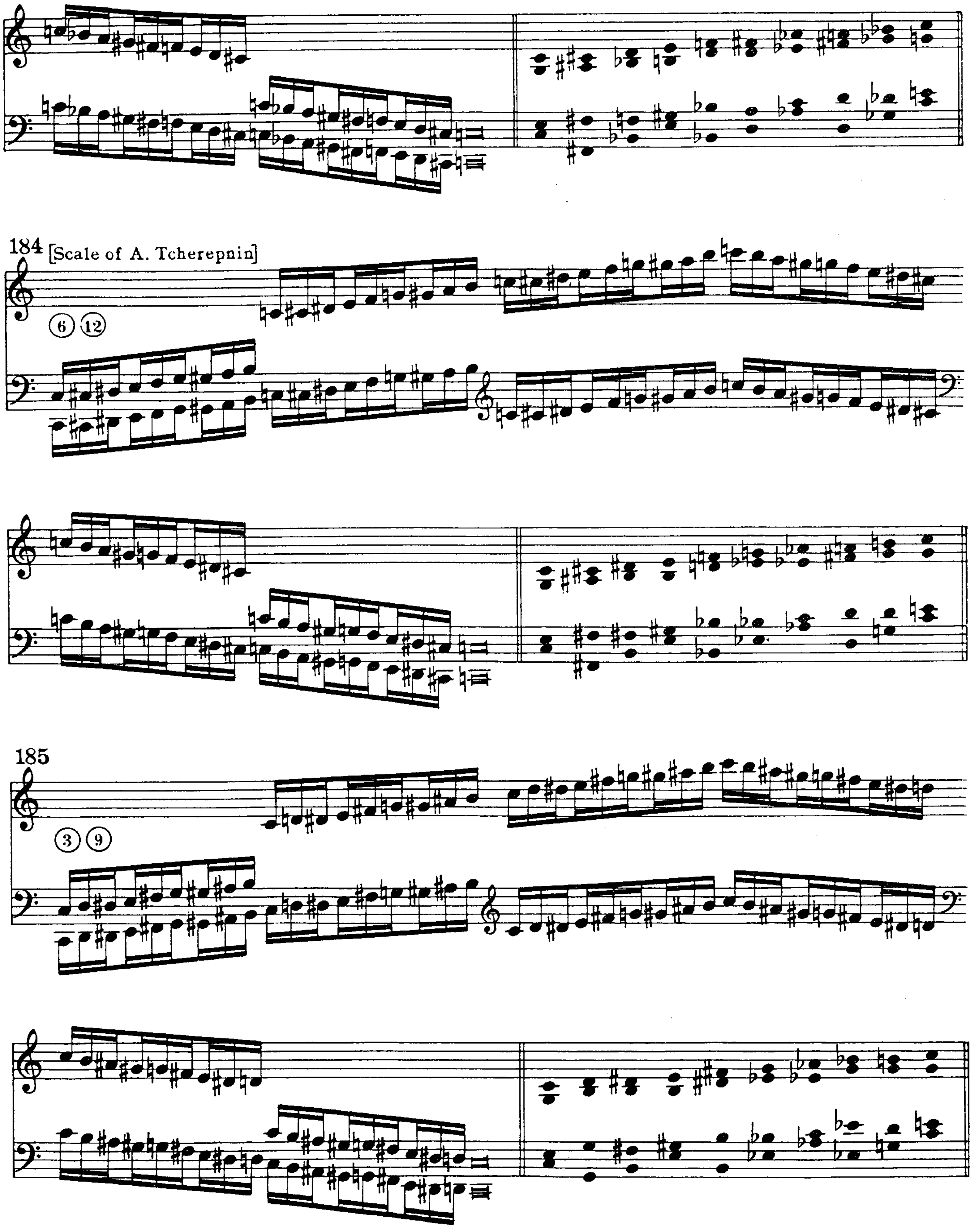




### Interpolation of Two Notes

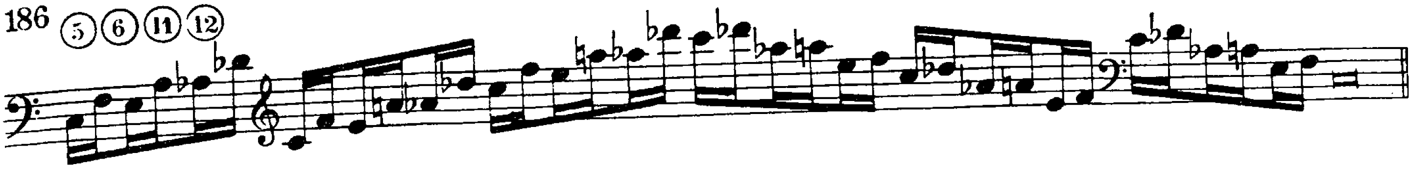
183
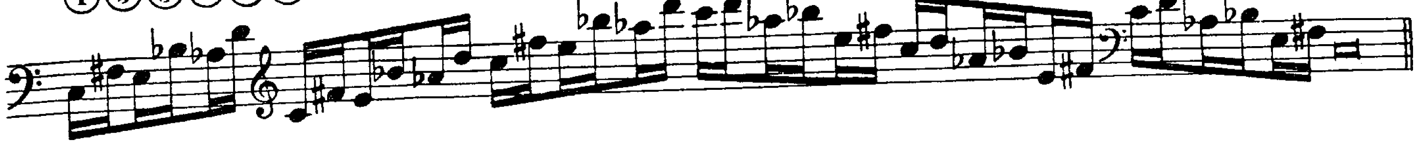



184
[Scale of A. Tcherepnin]
⑥ ⑫
185
③ ⑨

## Ultrapolation of One Note
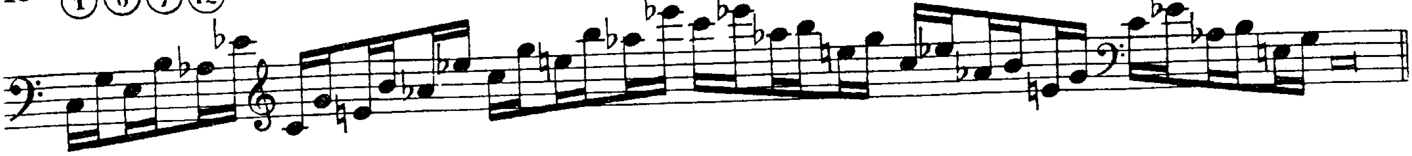
186 ⑤ ⑥ ⑪ ⑫
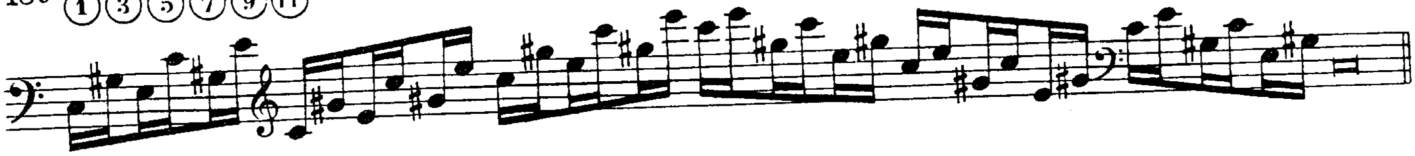


187 ① ③ ⑤ ⑦ ⑨ ⑪



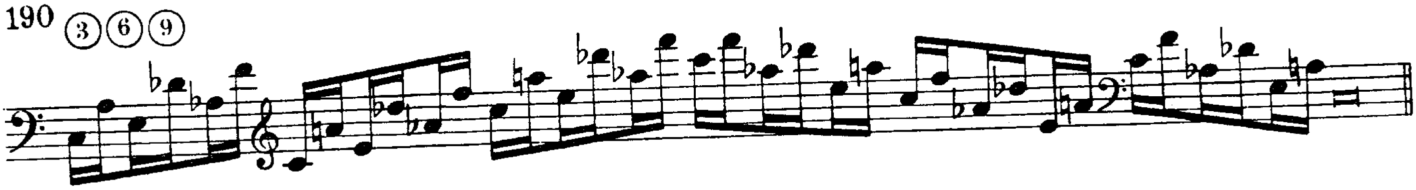
188 ① ⑥ ⑦ ⑫



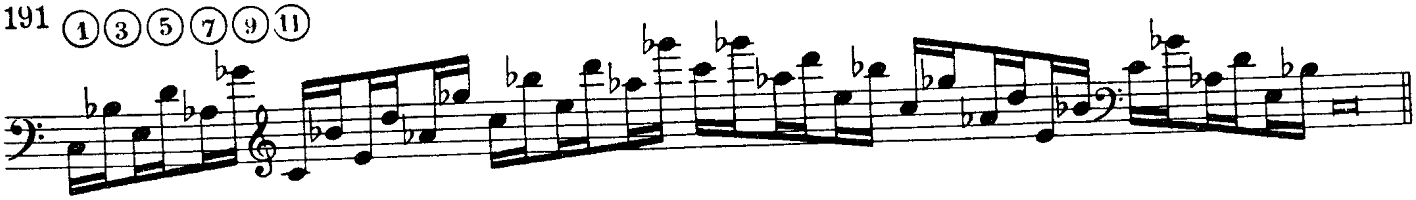
189 ① ③ ⑤ ⑦ ⑨ ⑪



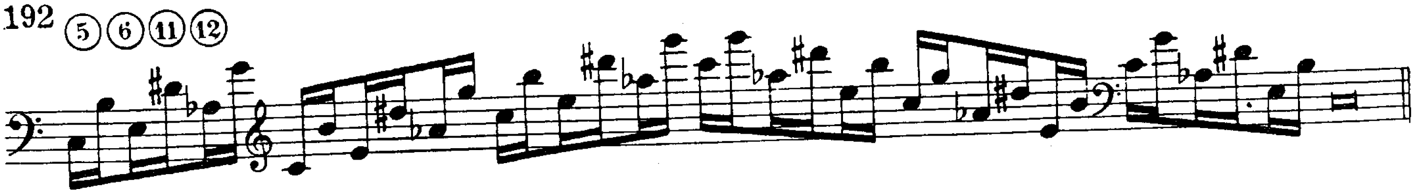
190 ③ ⑥ ⑨



191 ① ③ ⑤ ⑦ ⑨ ⑪

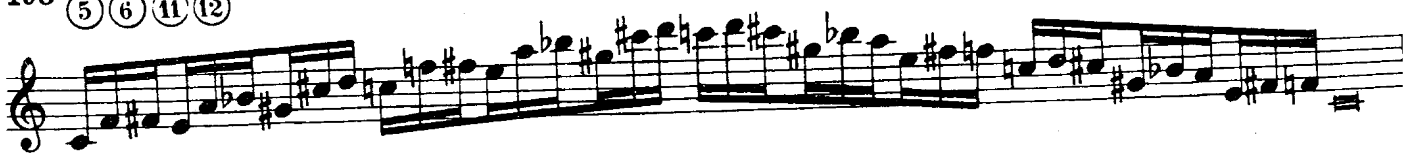


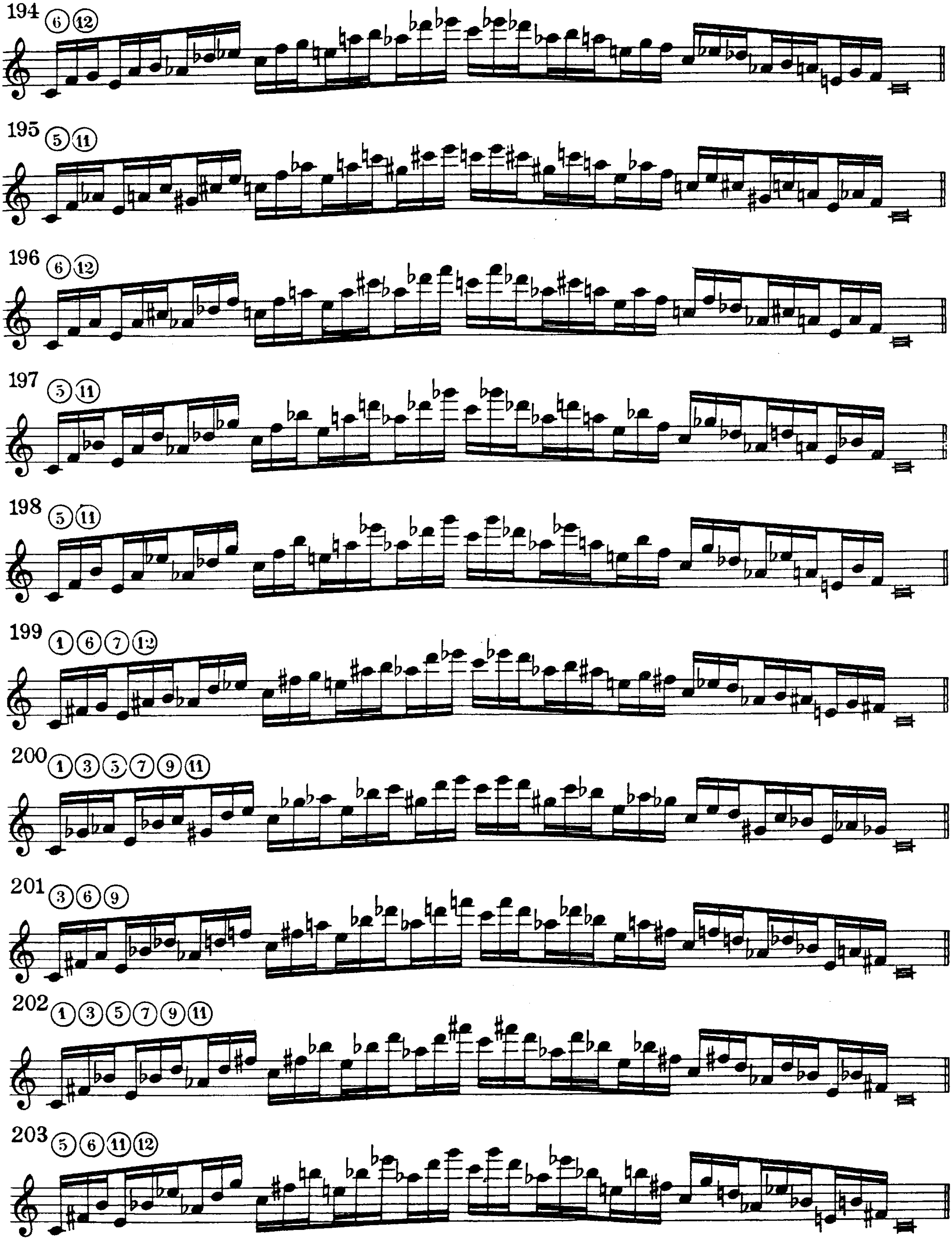
192 ⑤ ⑥ ⑪ ⑫

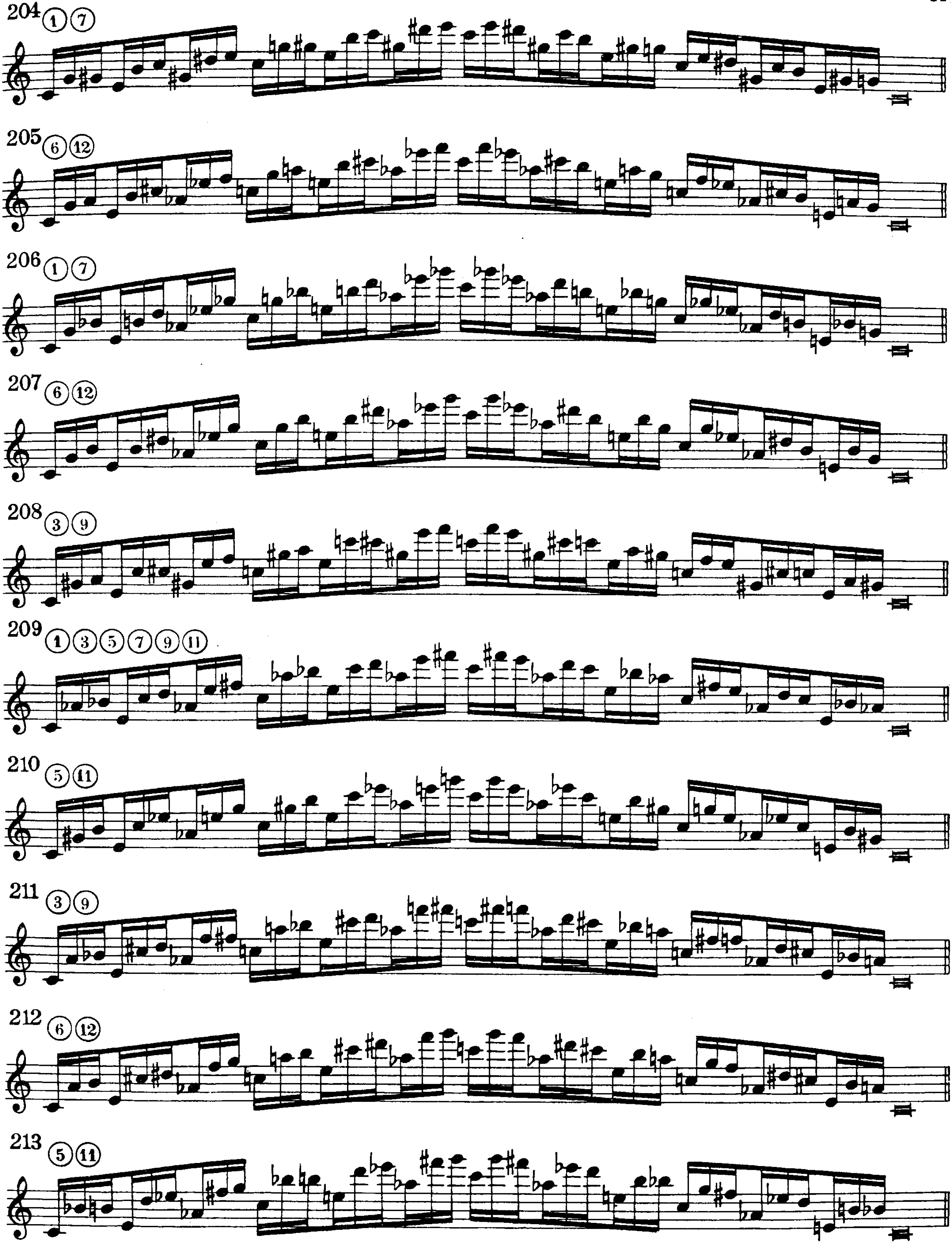


## Ultrapolation of Two Notes
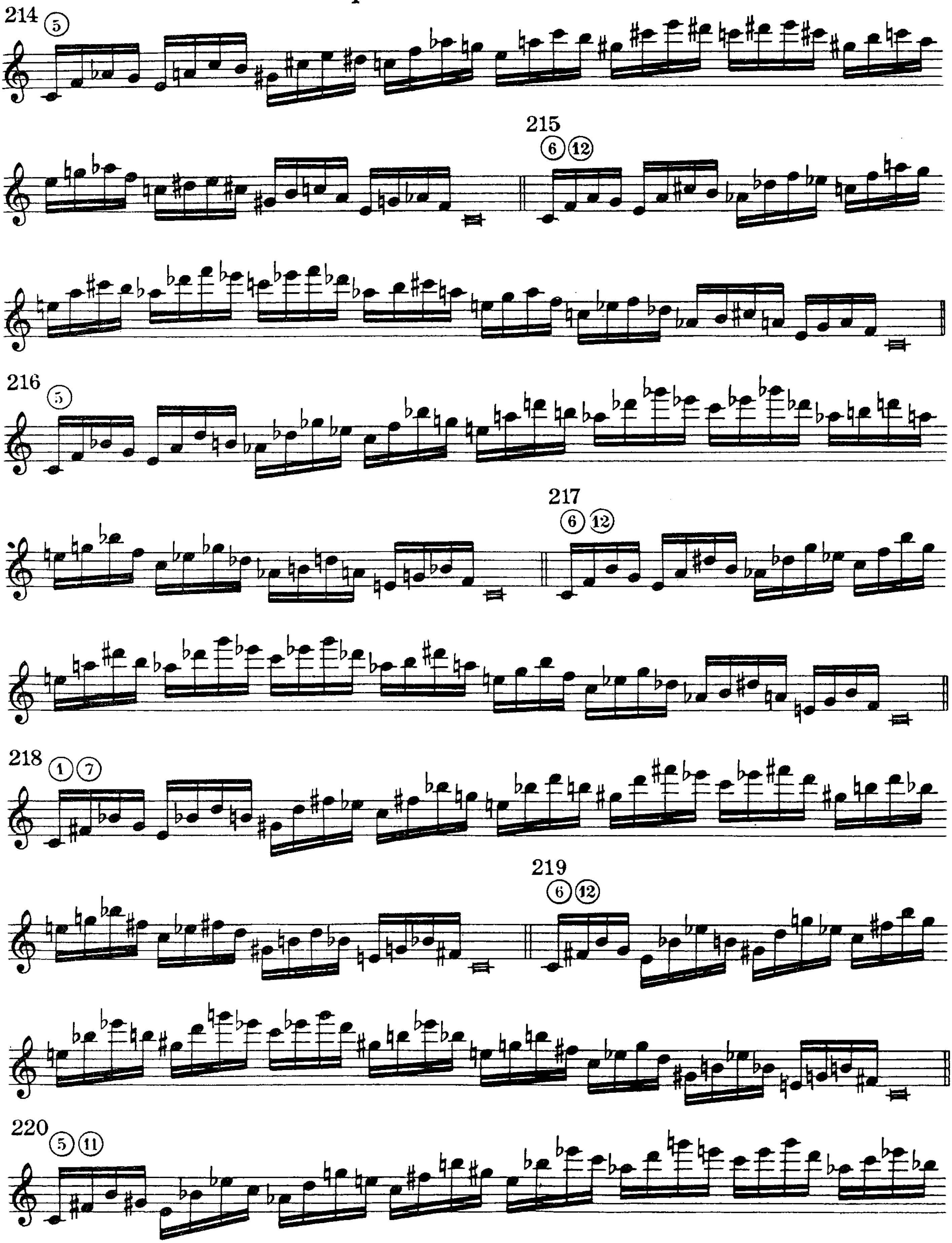
193 ⑤ ⑥ ⑪ ⑫
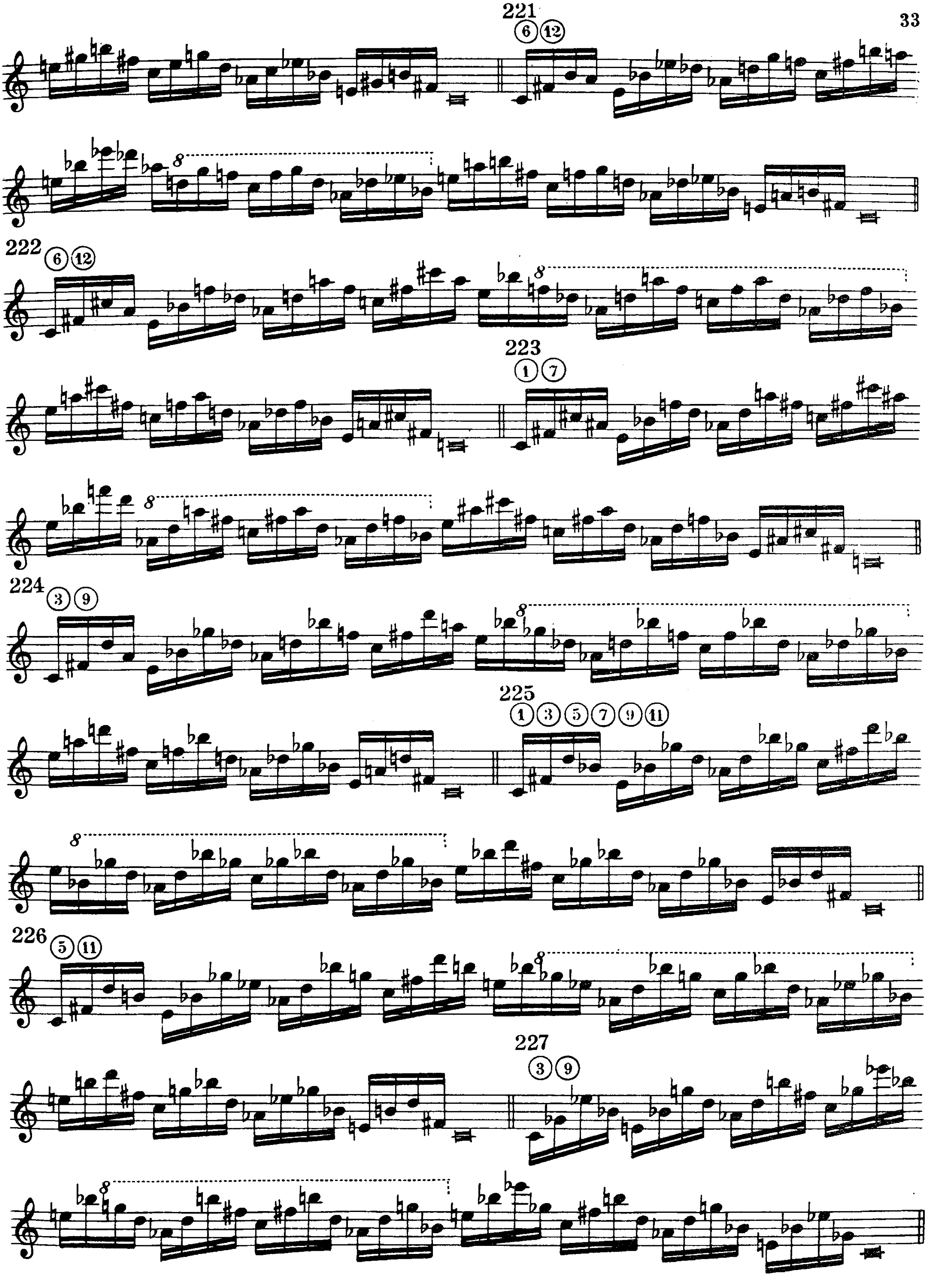


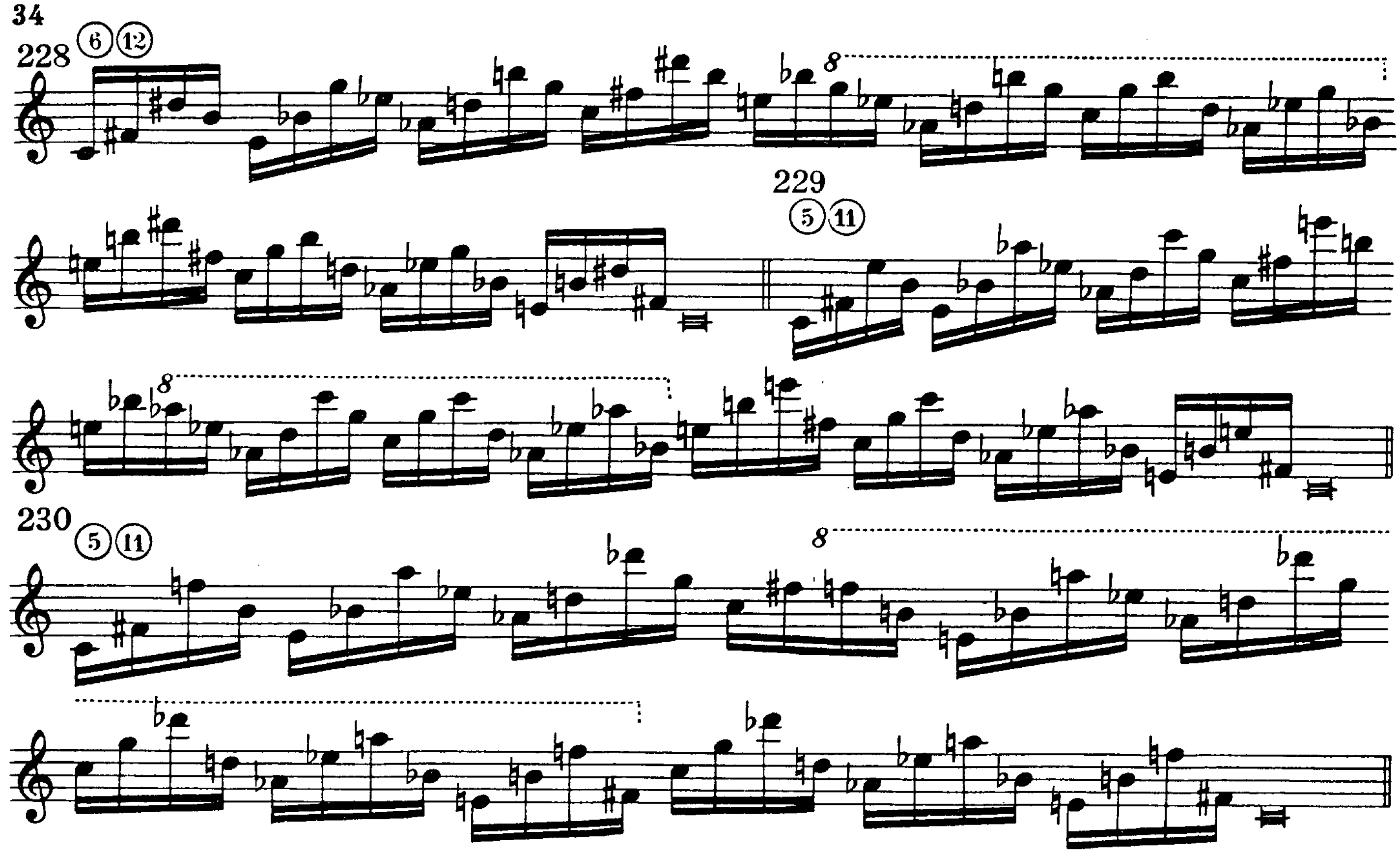

194 ⑥ ⑫
195 ⑤ ⑪
196 ⑥ ⑫
197 ⑤ ⑪
198 ⑤ ⑪
199 ① ⑥ ⑦ ⑫
200 ① ③ ⑤ ⑦ ⑨ ⑪
201 ③ ⑥ ⑨
202 ① ③ ⑤ ⑦ ⑨ ⑪
203 ⑤ ⑥ ⑪ ⑫


204 ① ⑦
205 ⑥ ⑫
206 ① ⑦
207 ⑥ ⑫
208 ③ ⑨
209 ① ③ ⑤ ⑦ ⑨ ⑪
210 ⑤ ⑪
211 ③ ⑨
212 ⑥ ⑫
213 ⑤ ⑪
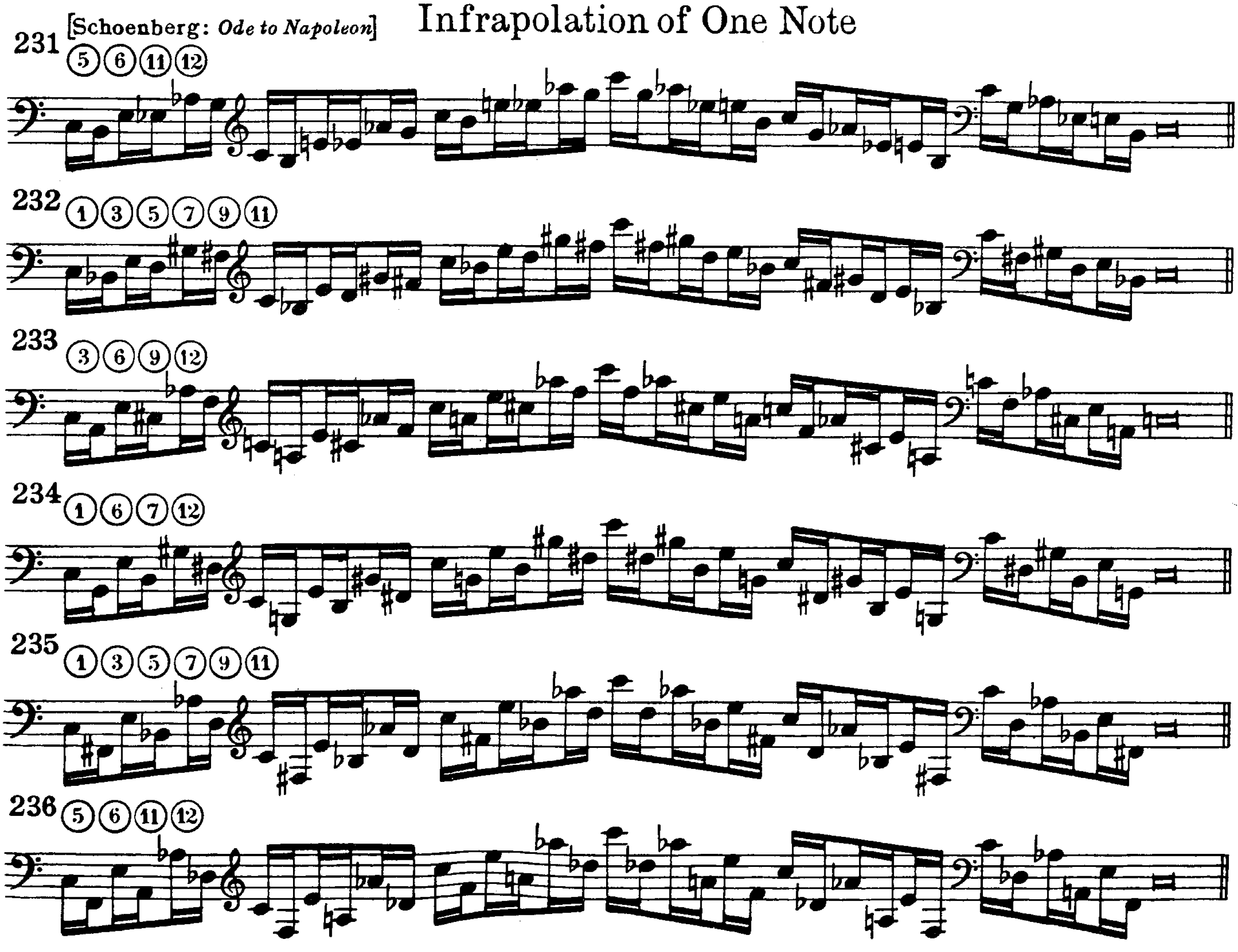
# Ultrapolation of Three Notes
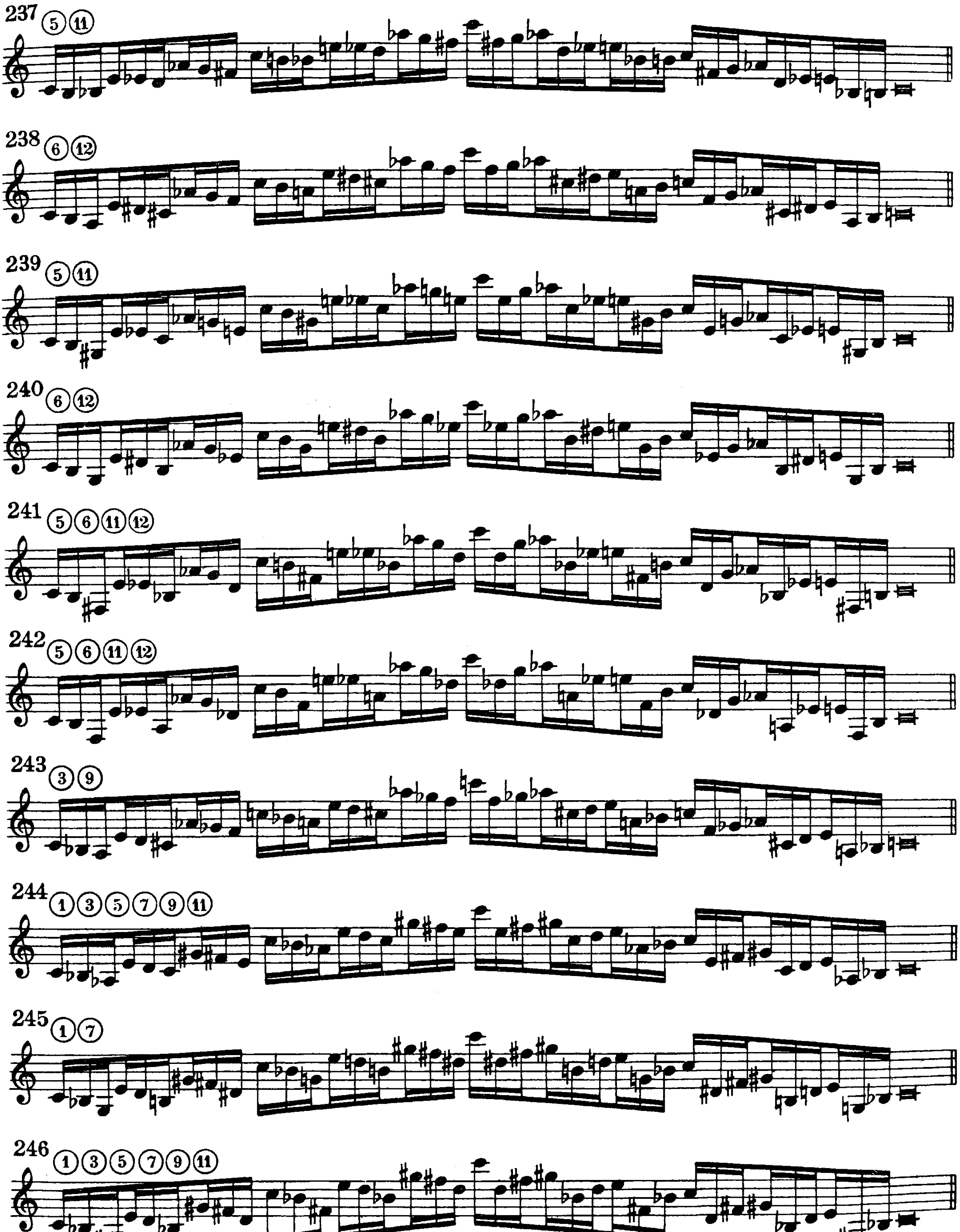



221
⑥ ⑫
222
⑥ ⑫
223
① ⑦
224
③ ⑨
225
① ③ ⑤ ⑦ ⑨ ⑪
226
⑤ ⑪
227
③ ⑨
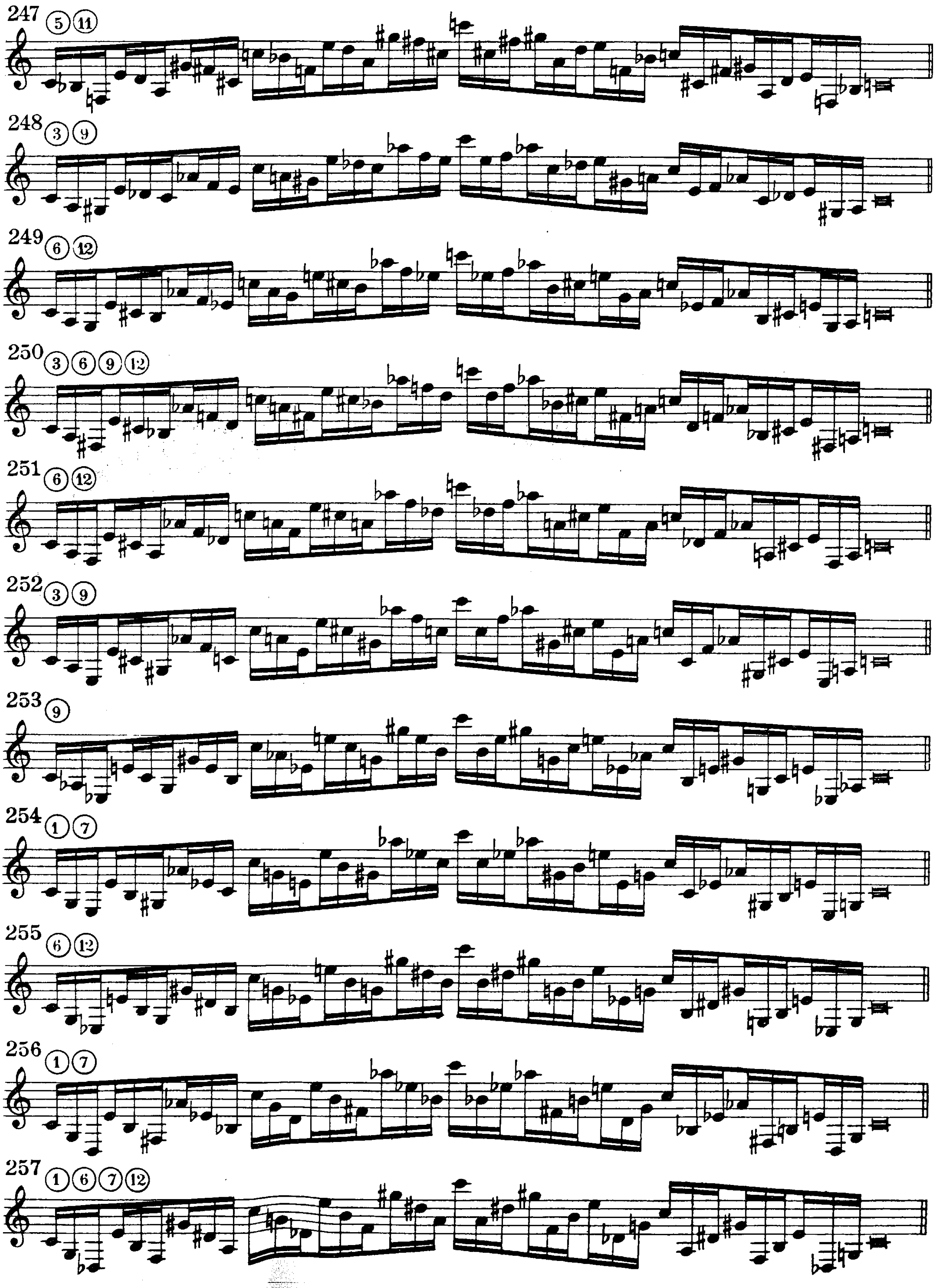



## Infrapolation of One Note
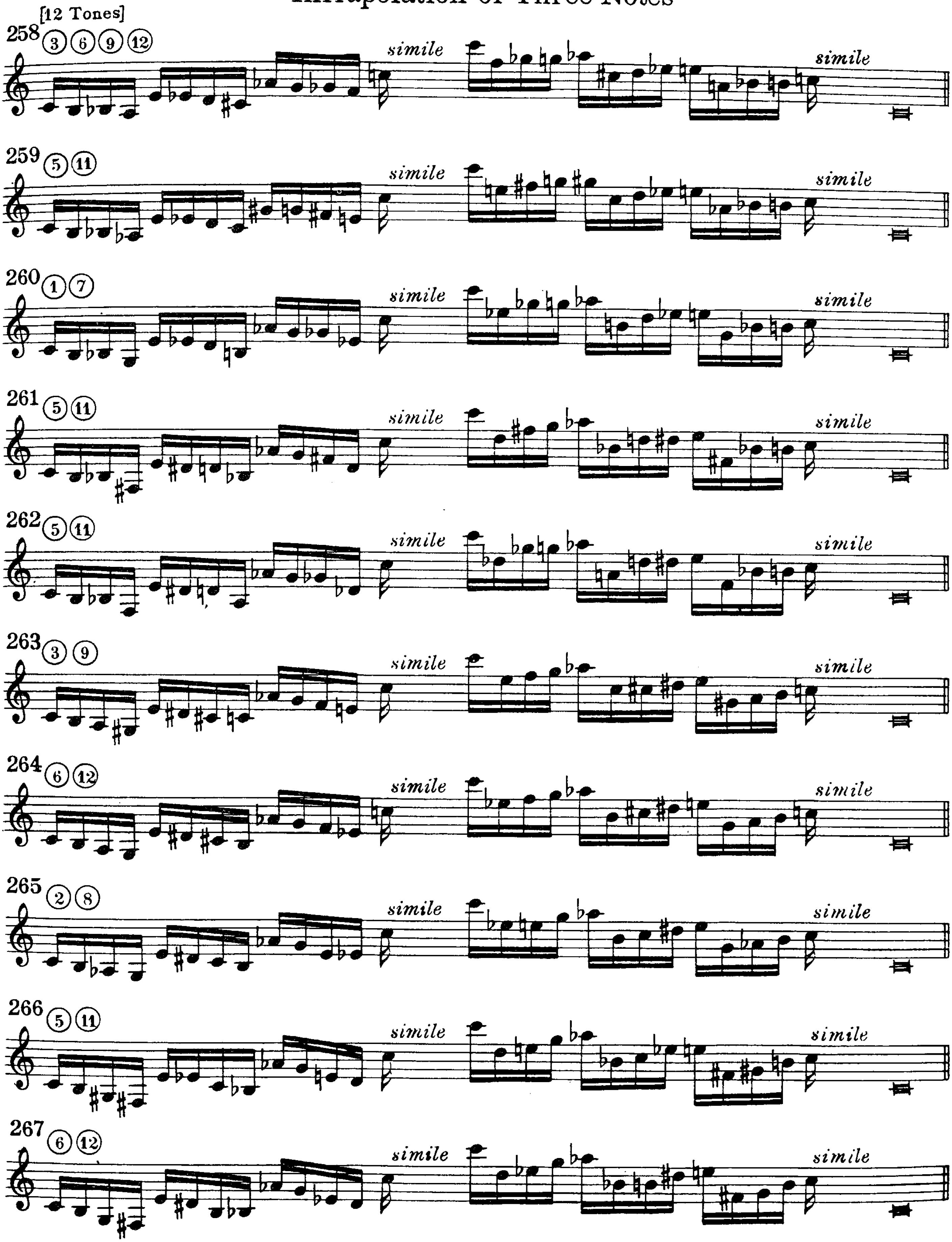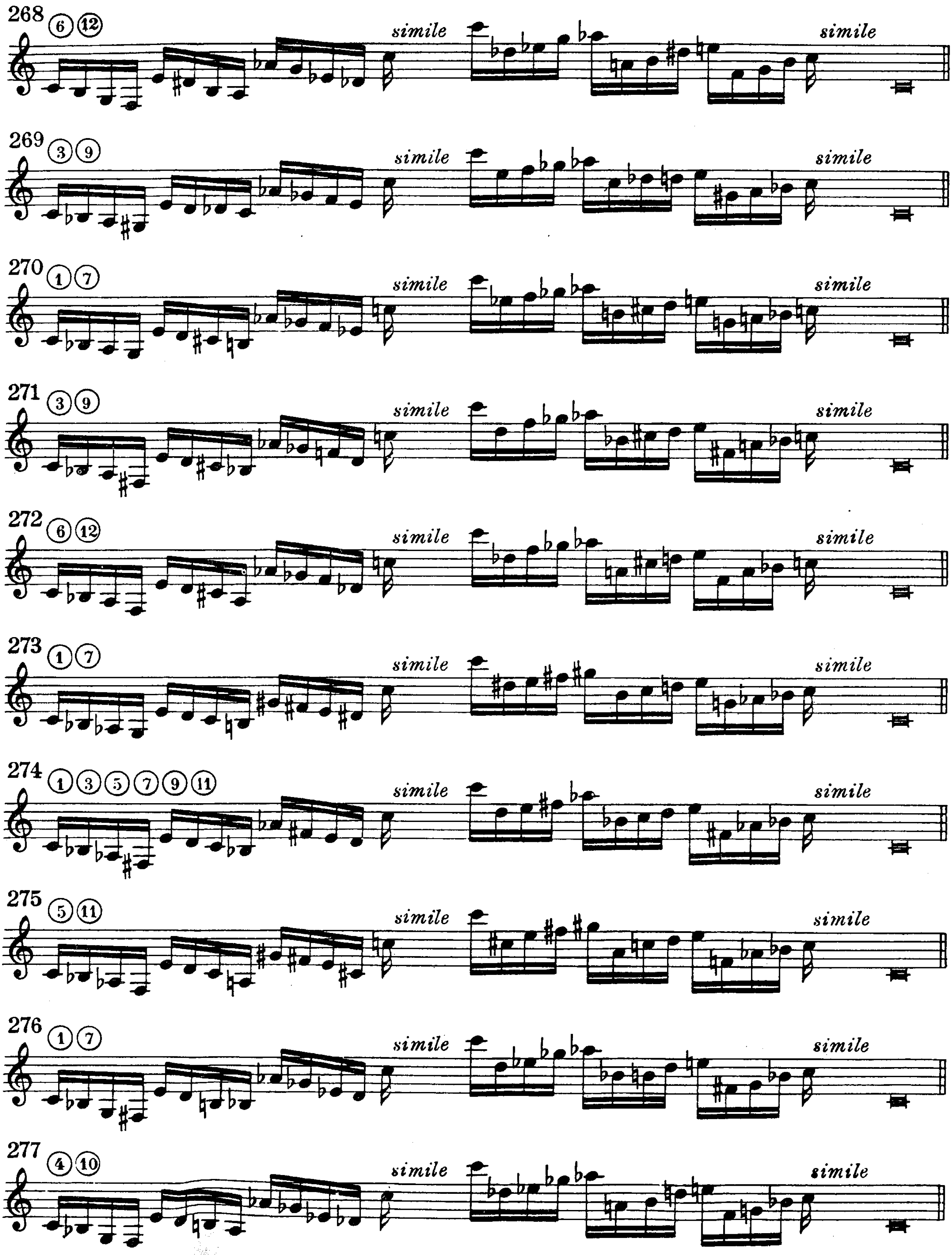


# Infrapolation of Two Notes
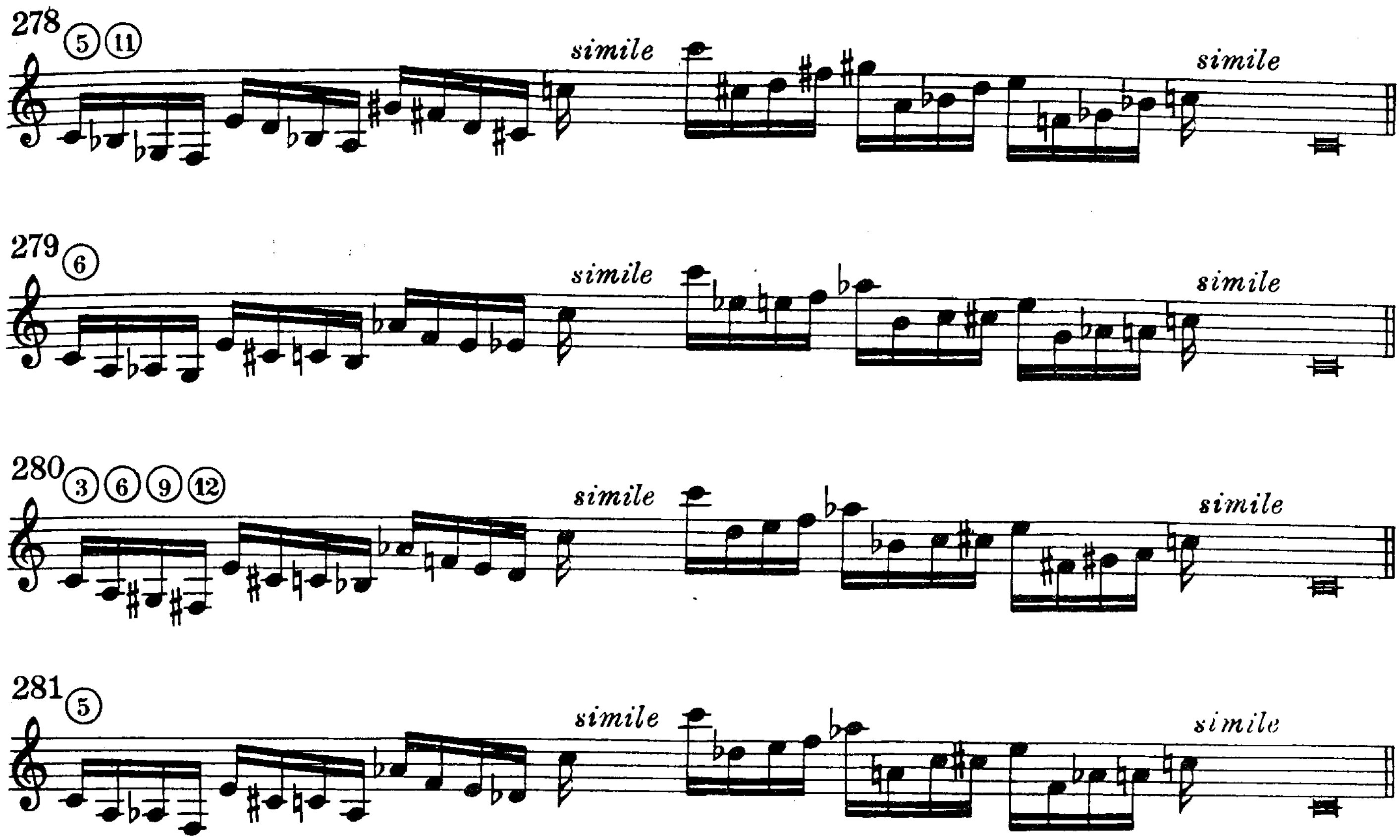



247 ⑤ ⑪
248 ③ ⑨
249 ⑥ ⑫
250 ③ ⑥ ⑨ ⑫
251 ⑥ ⑫
252 ③ ⑨
253 ⑨
254 ① ⑦
255 ⑥ ⑫
256 ① ⑦
257 ① ⑥ ⑦ ⑫
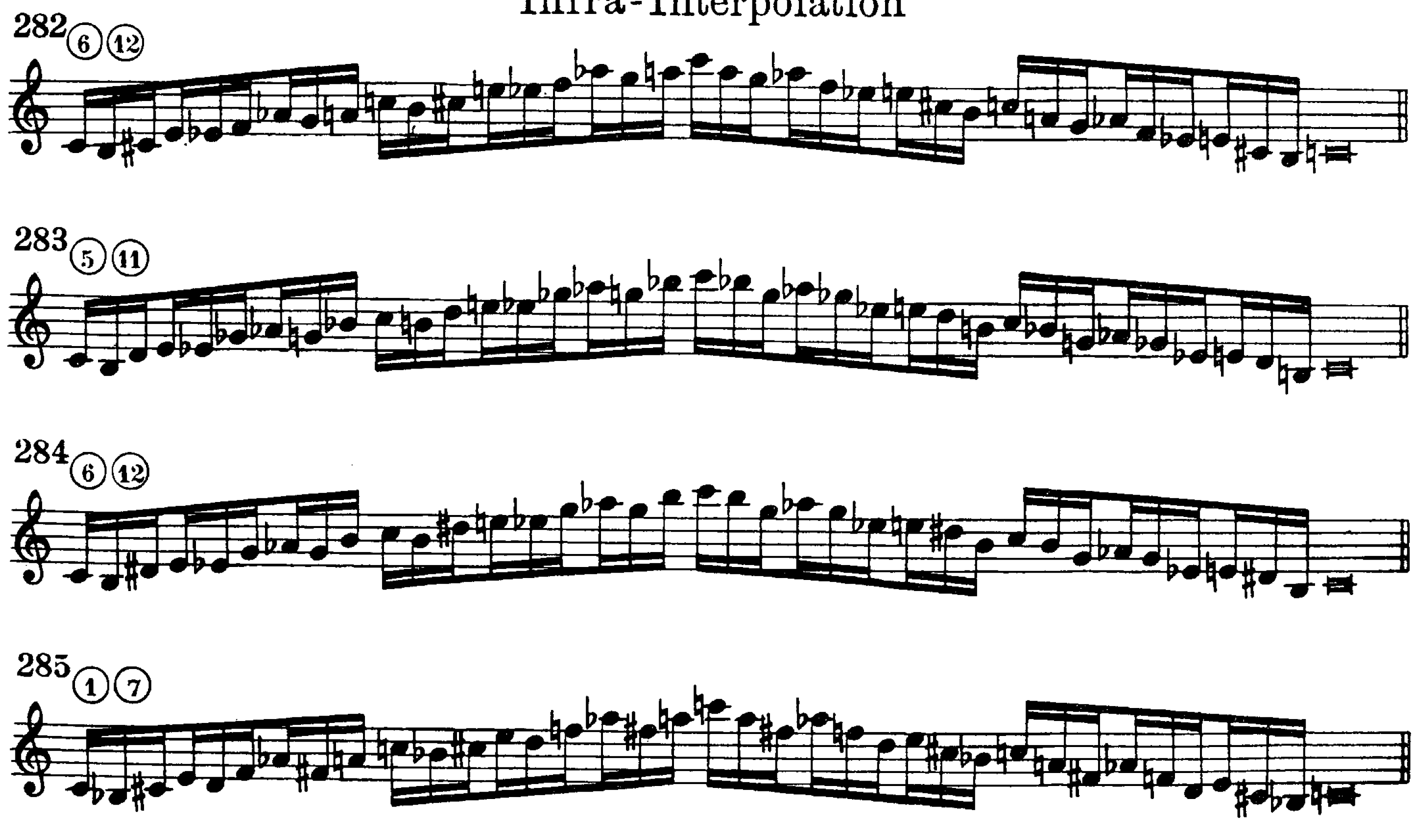
# Infrapolation of Three Notes
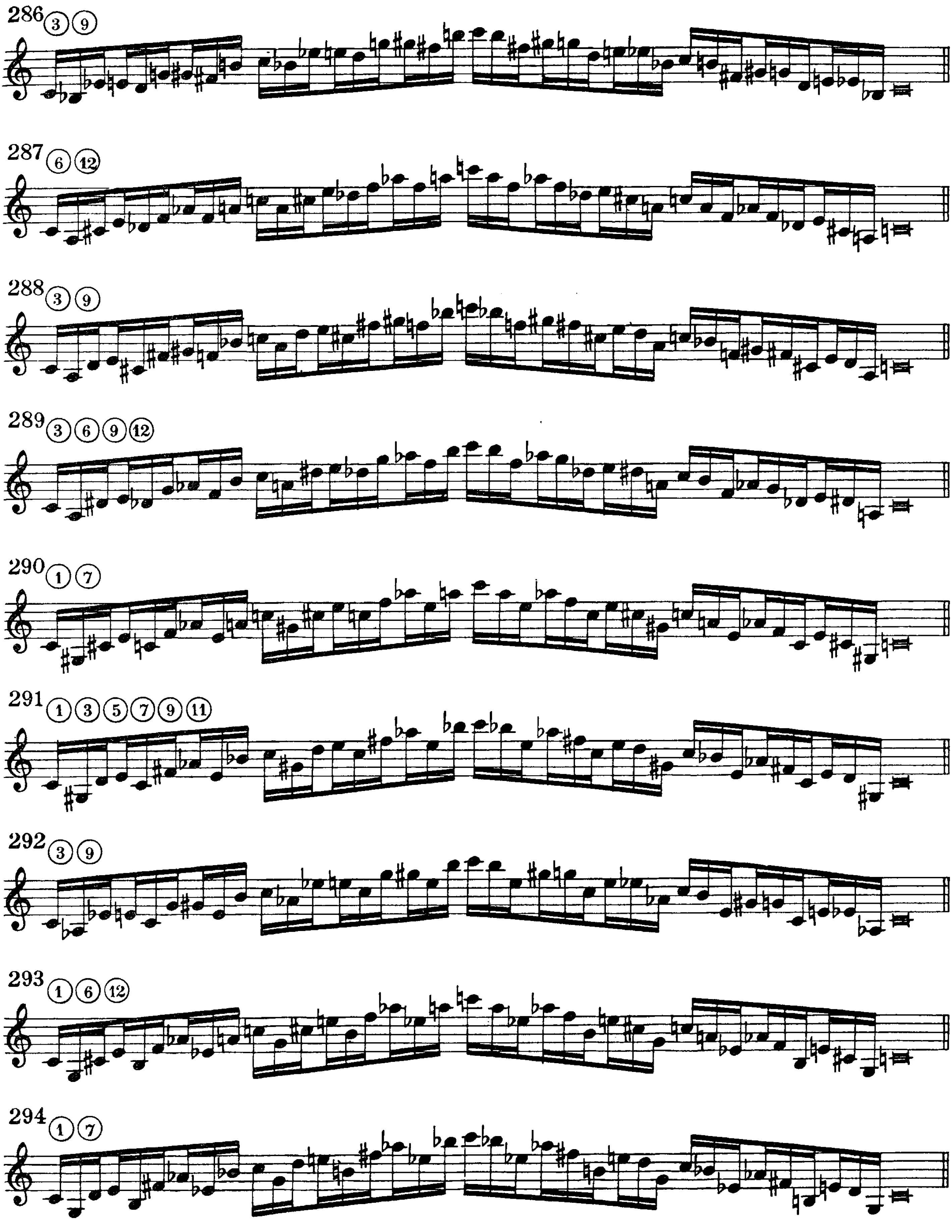



268 (6) (12)
simile
simile
269 (3) (9)
simile
simile
270 (1) (7)
simile
simile
271 (3) (9)
simile
simile
272 (6) (12)
simile
simile
273 (1) (7)
simile
simile
274 (1) (3) (5) (7) (9) (11)
simile
simile
275 (5) (11)
simile
simile
276 (1) (7)
simile
simile
277 (4) (10)
simile
simile
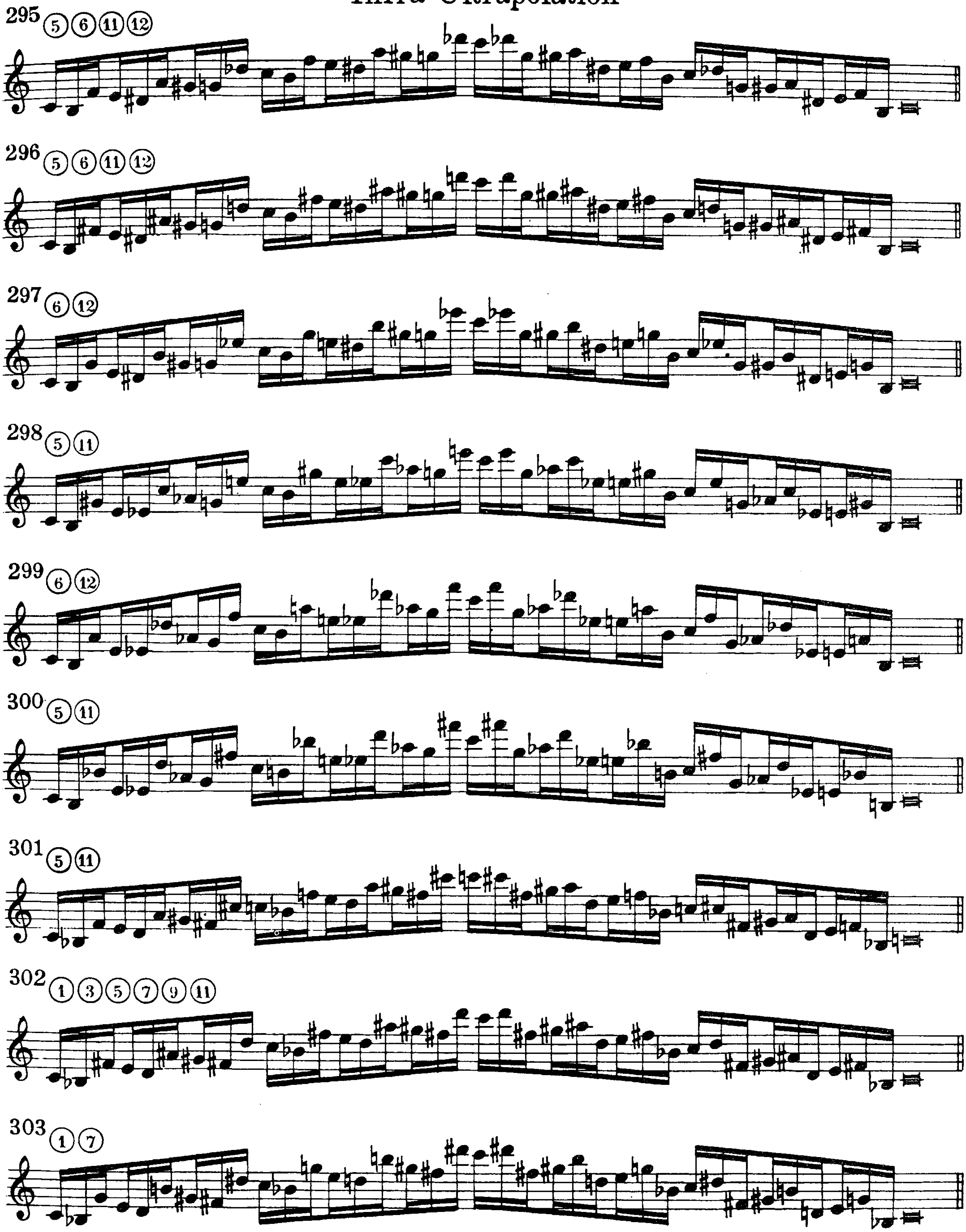


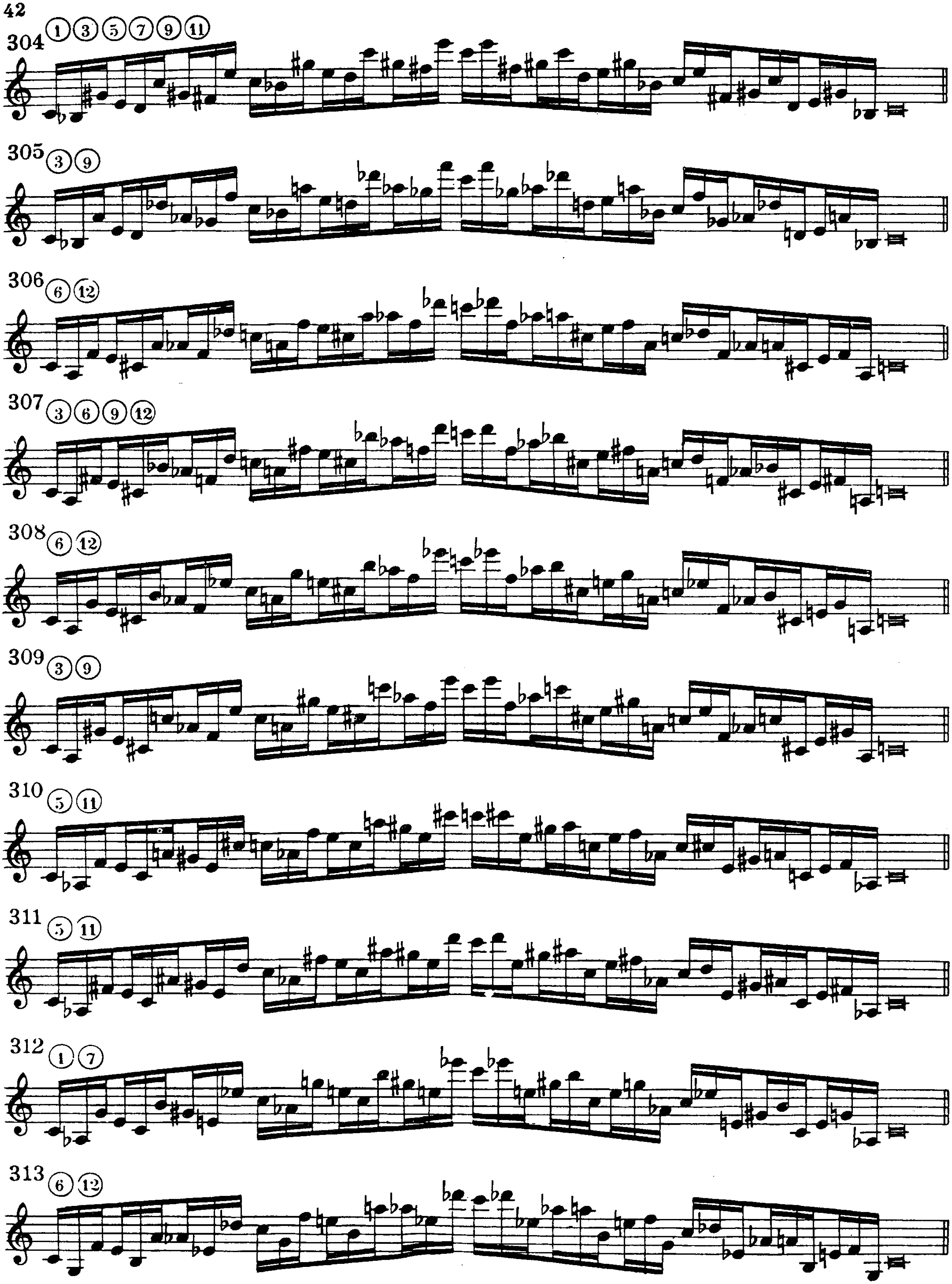

## Infra-Interpolation

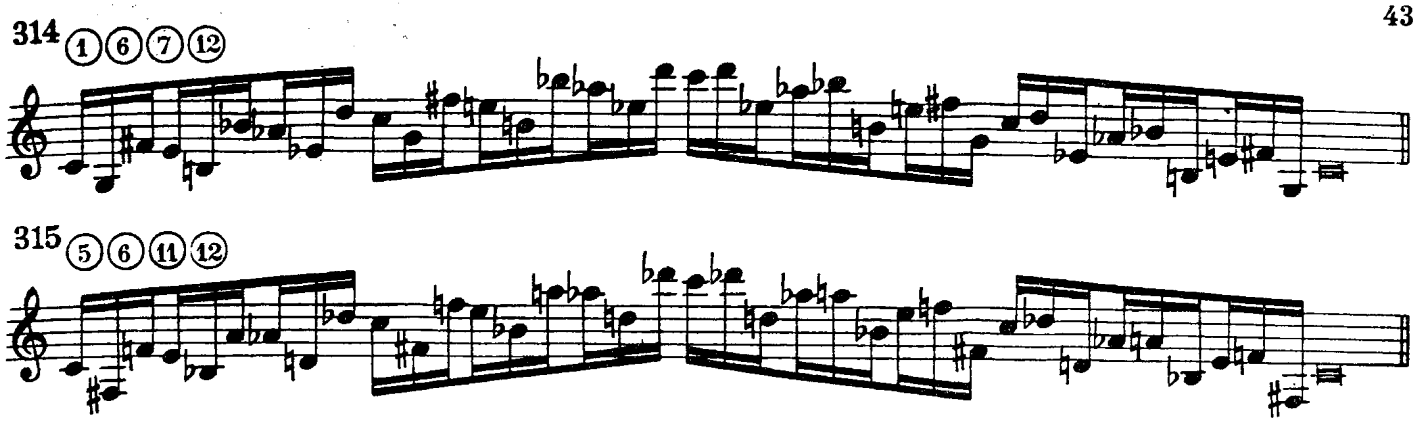



286 ③ ⑨
287 ⑥ ⑫
288 ③ ⑨
289 ③ ⑥ ⑨ ⑫
290 ① ⑦
291 ① ③ ⑤ ⑦ ⑨ ⑪
292 ③ ⑨
293 ① ⑥ ⑫
294 ① ⑦
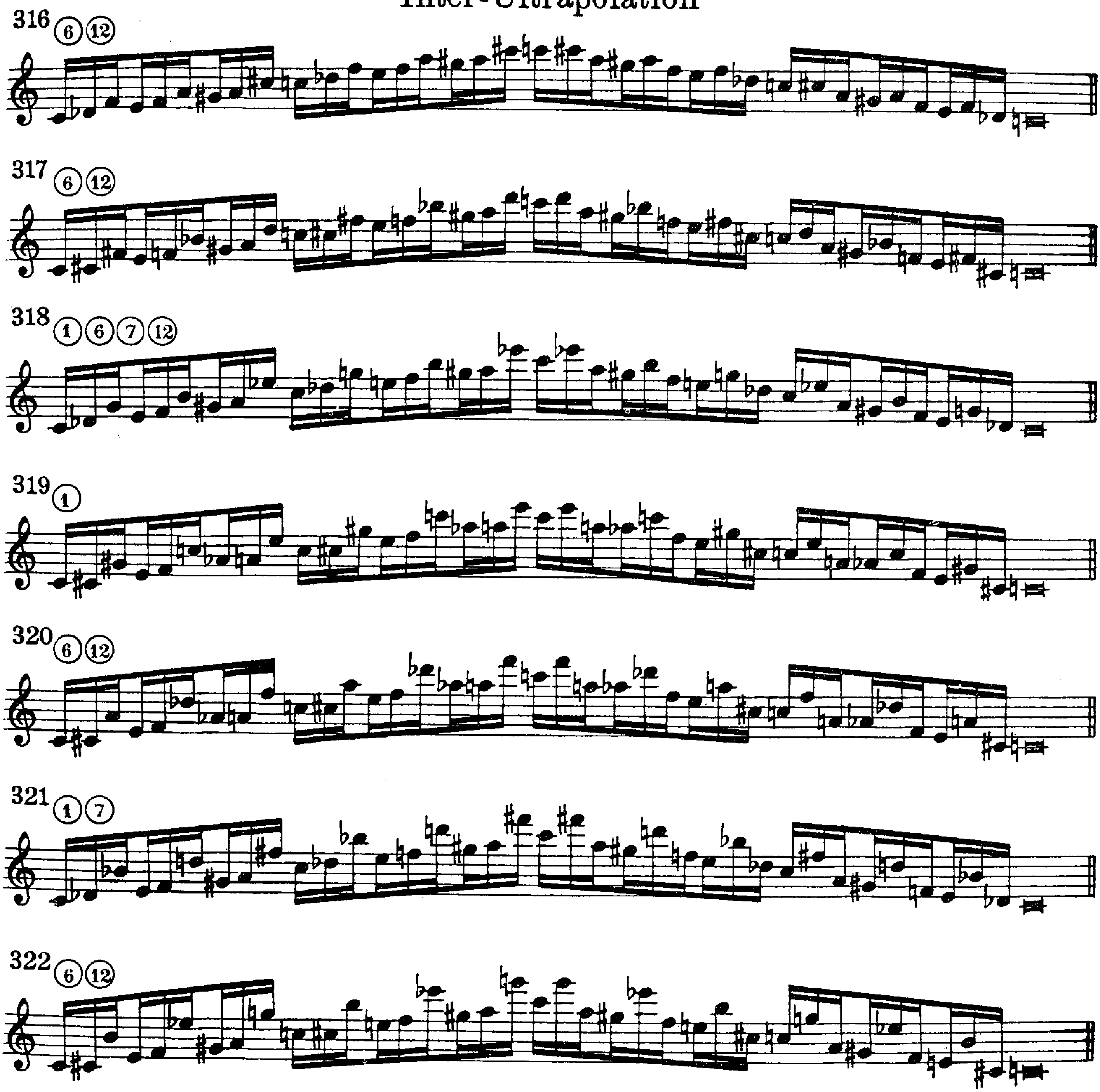
# Infra-Ultrapolation
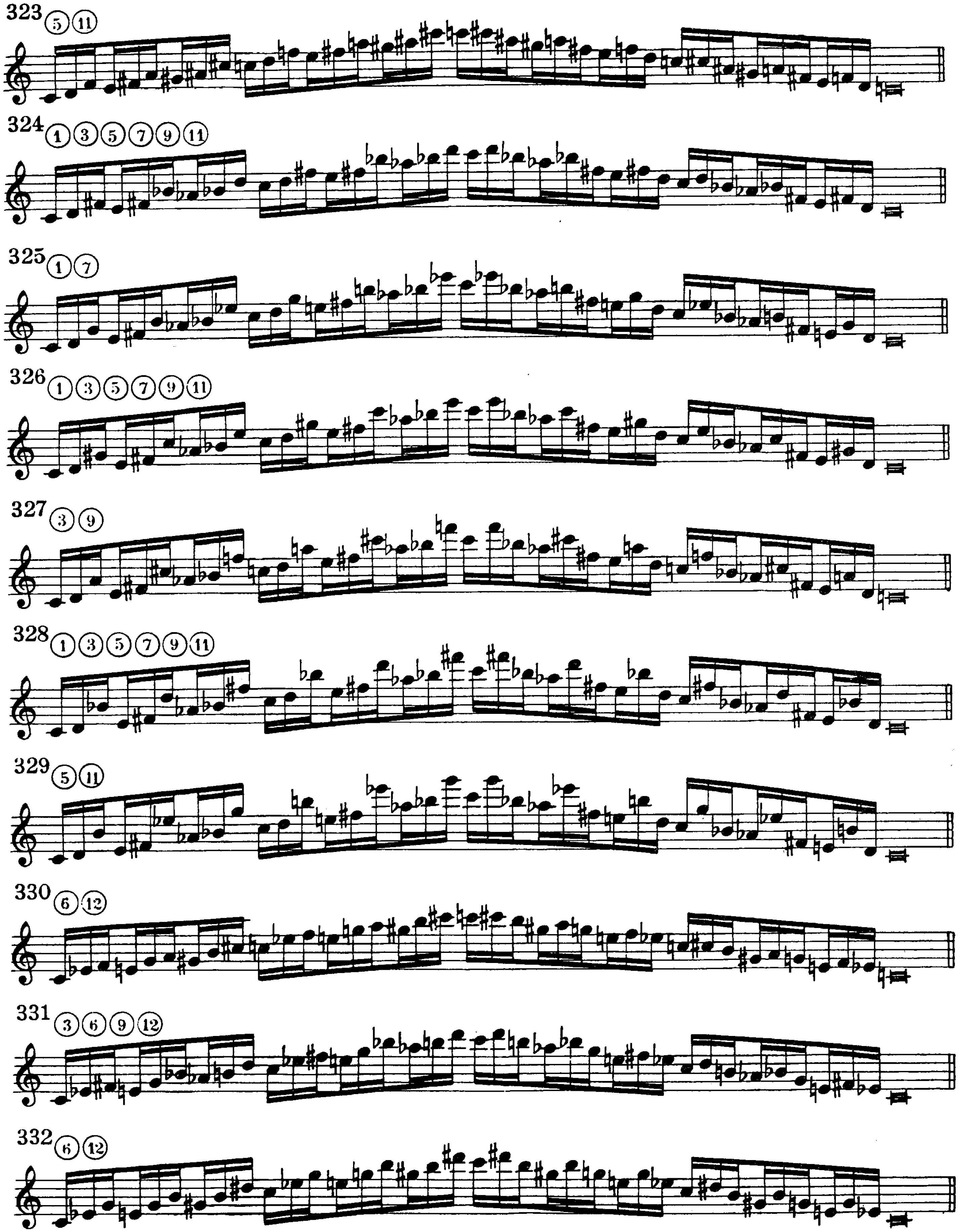


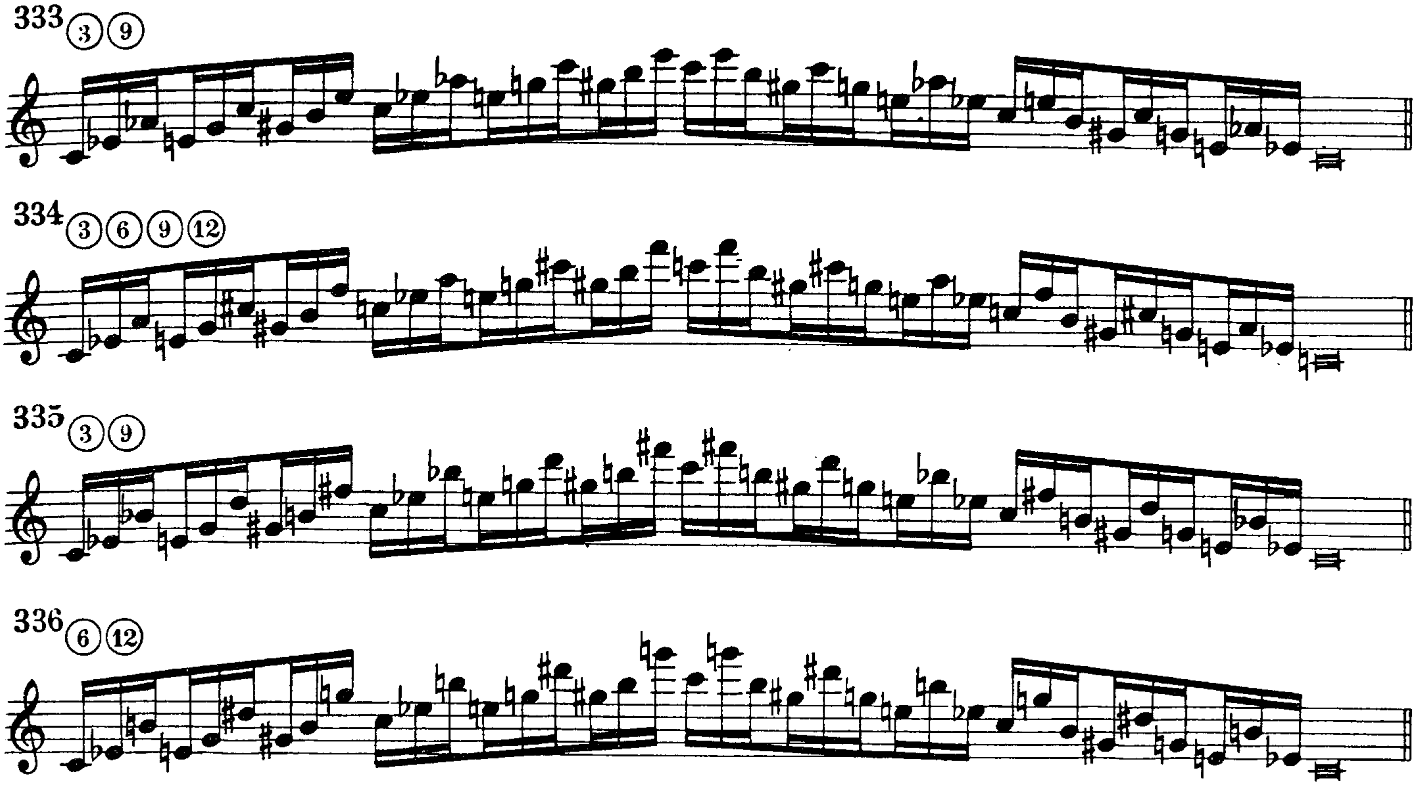

304 ① ③ ⑤ ⑦ ⑨ ⑪
305 ③ ⑨
306 ⑥ ⑫
307 ③ ⑥ ⑨ ⑫
308 ⑥ ⑫
309 ③ ⑨
310 ⑤ ⑪
311 ⑤ ⑪
312 ① ⑦
313 ⑥ ⑫
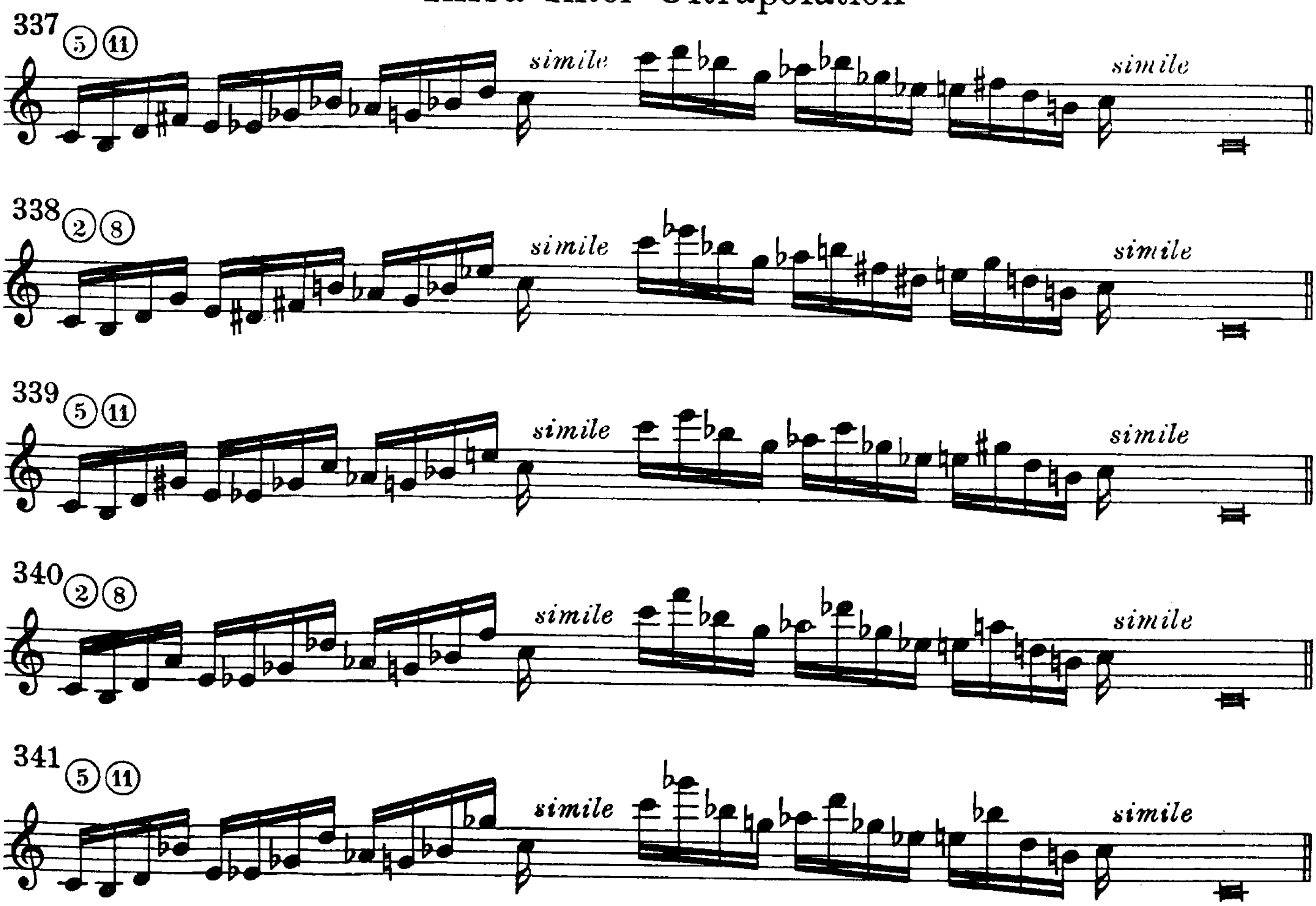



## Inter-Ultrapolation
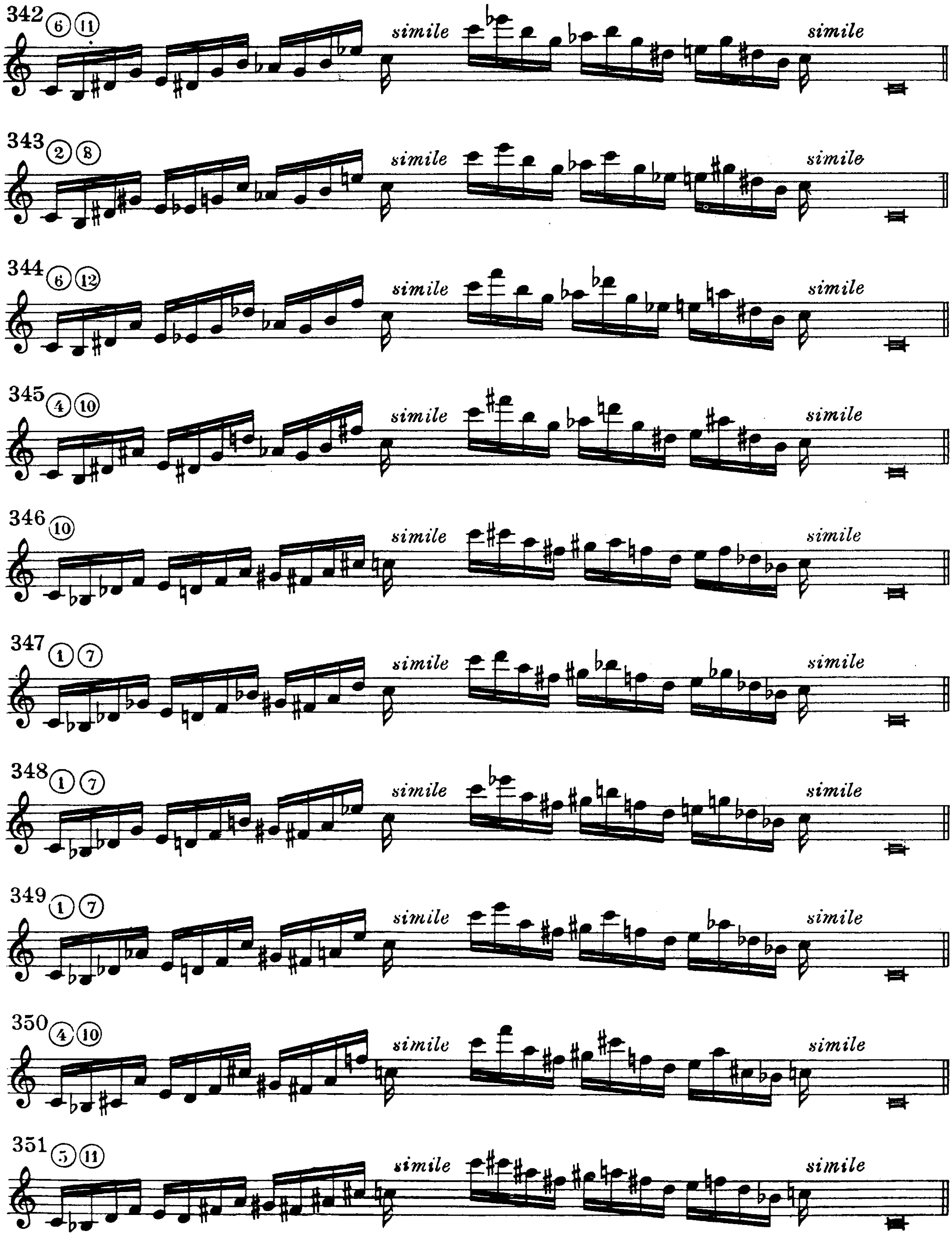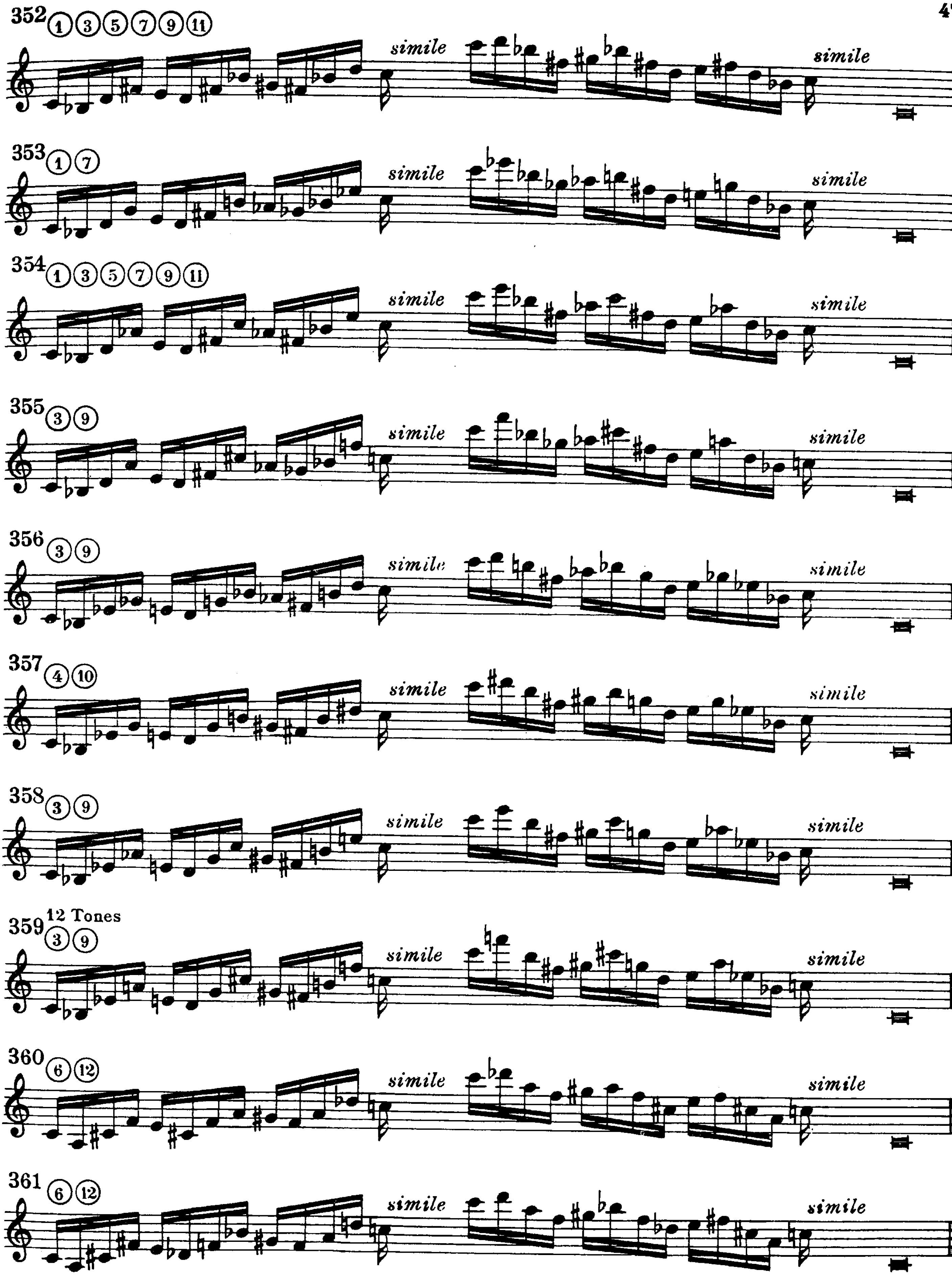



323 ⑤ ⑪
324 ① ③ ⑤ ⑦ ⑨ ⑪
325 ① ⑦
326 ① ③ ⑤ ⑦ ⑨ ⑪
327 ③ ⑨
328 ① ③ ⑤ ⑦ ⑨ ⑪
329 ⑤ ⑪
330 ⑥ ⑫
331 ③ ⑥ ⑨ ⑫
332 ⑥ ⑫
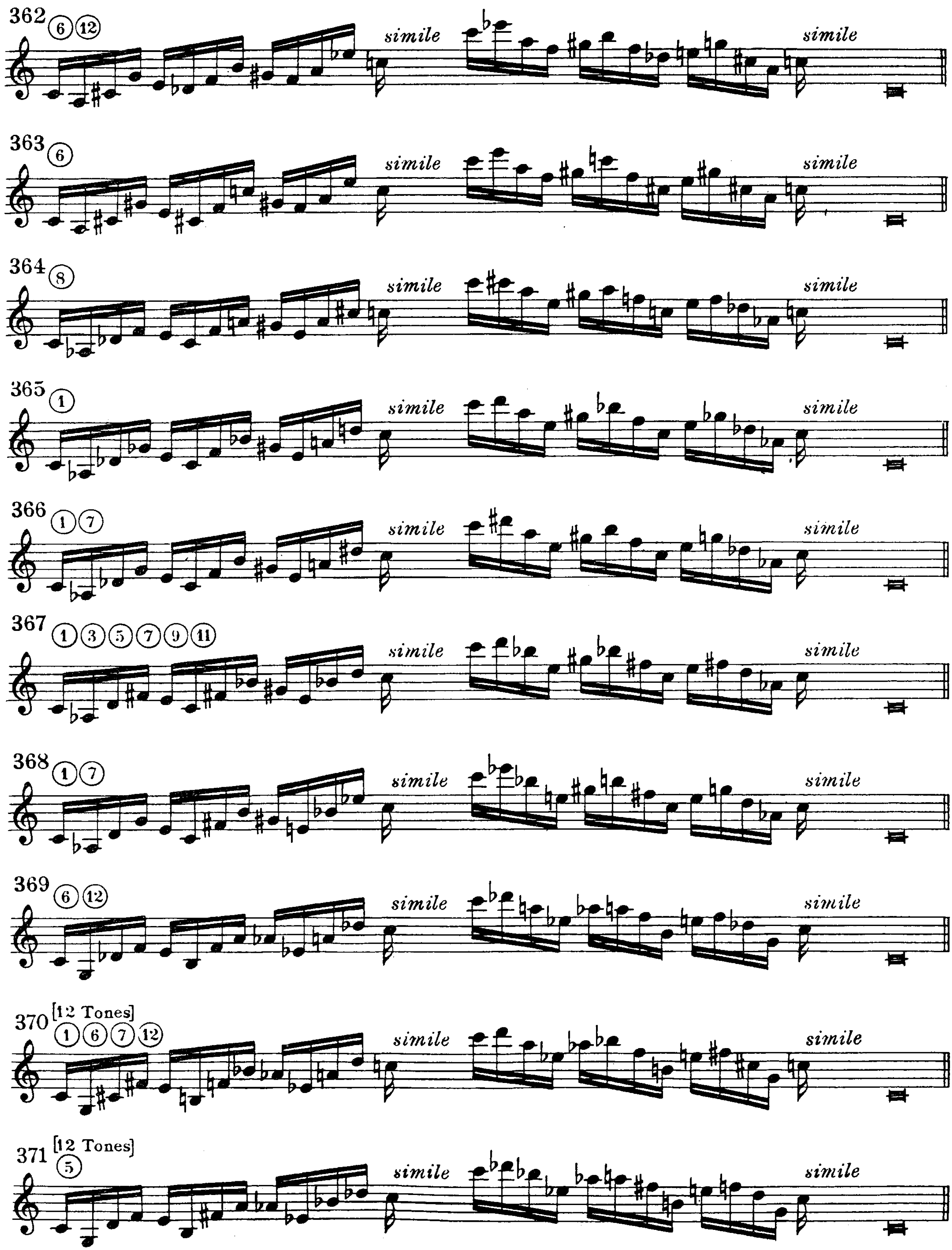



## Infra-Inter-Ultrapolation
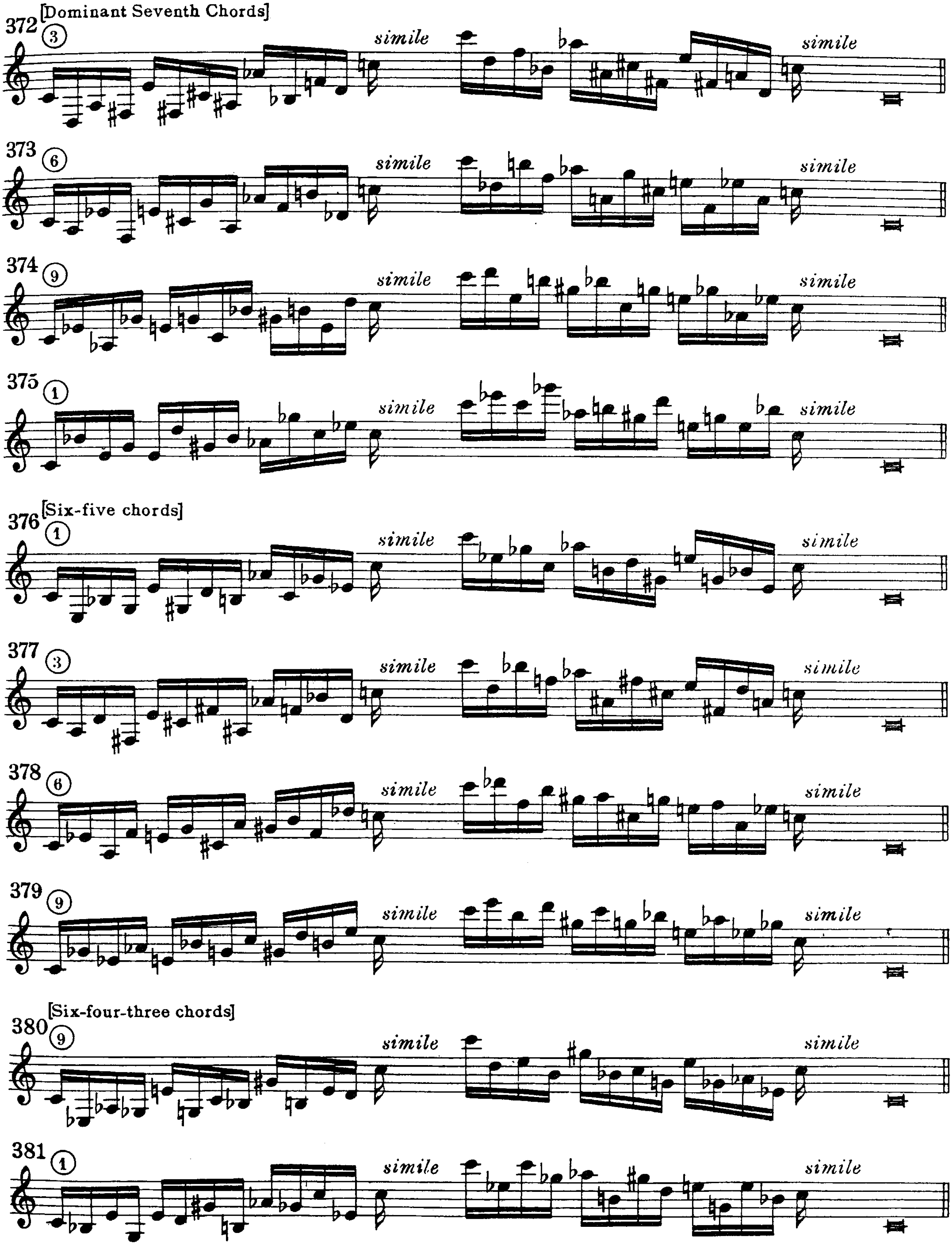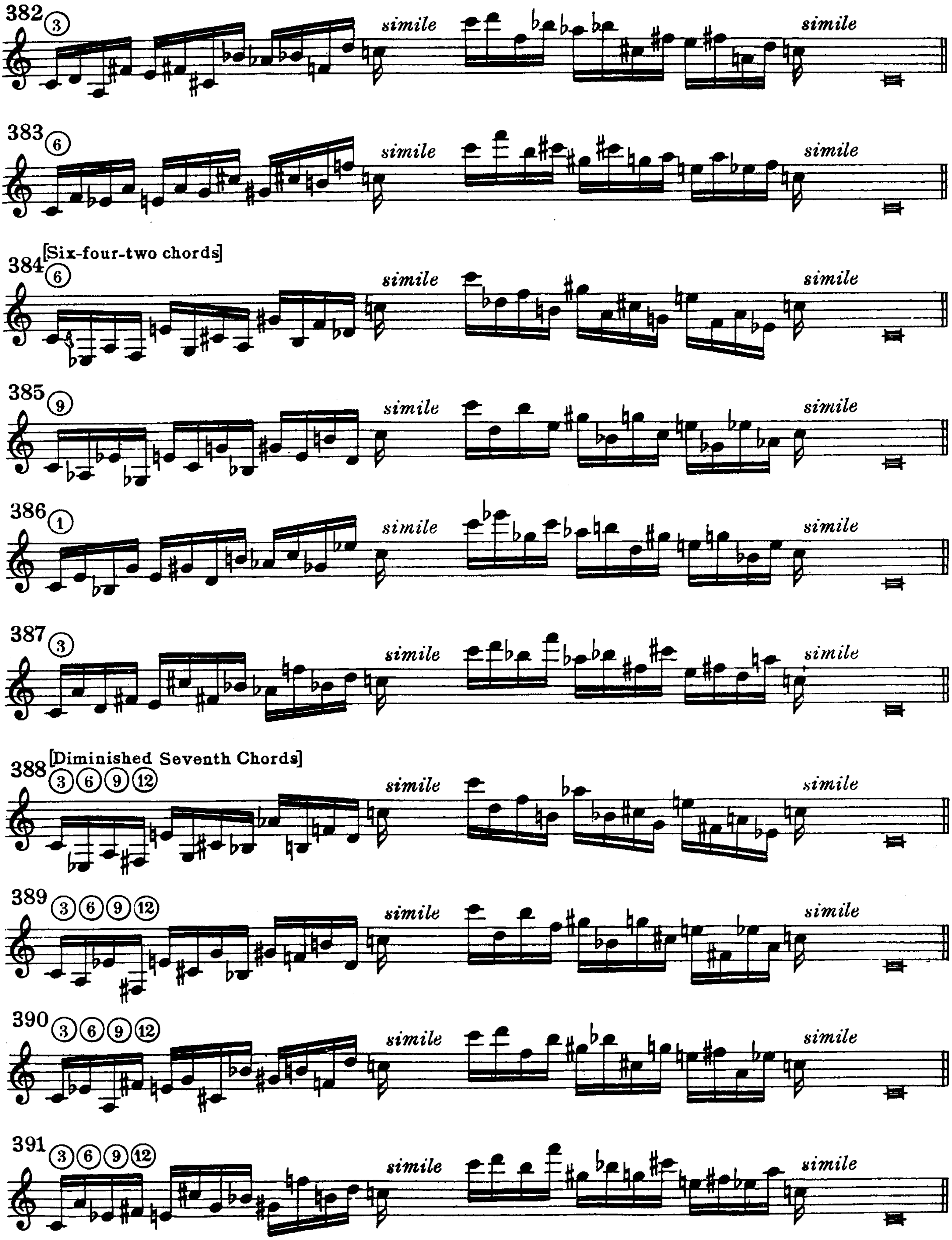



342 ⑥ ⑪ simile simile
343 ② ⑧ simile simile
344 ⑥ ⑫ simile simile
345 ④ ⑩ simile simile
346 ⑩ simile simile
347 ① ⑦ simile simile
348 ① ⑦ simile simile
349 ① ⑦ simile simile
350 ④ ⑩ simile simile
351 ⑤ ⑪ simile simile


352 ① ③ ⑤ ⑦ ⑨ ⑪
simile
simile
353 ① ⑦
simile
simile
354 ① ③ ⑤ ⑦ ⑨ ⑪
simile
simile
355 ③ ⑨
simile
simile
356 ③ ⑨
simile
simile
357 ④ ⑩
simile
simile
358 ③ ⑨
simile
simile
359 12 Tones
③ ⑨
simile
simile
360 ⑥ ⑫
simile
simile
361 ⑥ ⑫
simile
simile


362 ⑥⑫
simile
simile
363 ⑥
simile
simile
364 ⑧
simile
simile
365 ①
simile
simile
366 ①⑦
simile
simile
367 ①③⑤⑦⑨⑪
simile
simile
368 ①⑦
simile
simile
369 ⑥⑫
simile
simile
370 [12 Tones] ①⑥⑦⑫
simile
simile
371 [12 Tones] ⑤
simile
simile

# Miscellaneous Patterns




382 ③
simile
simile
383 ⑥
simile
simile
384 [Six-four-two chords]
⑥
simile
simile
385 ⑨
simile
simile
386 ①
simile
simile
387 ③
simile
simile
388 [Diminished Seventh Chords]
③⑥⑨⑫
simile
simile
389 ③⑥⑨⑫
simile
simile
390 ③⑥⑨⑫
simile
simile
391 ③⑥⑨⑫
simile
simile
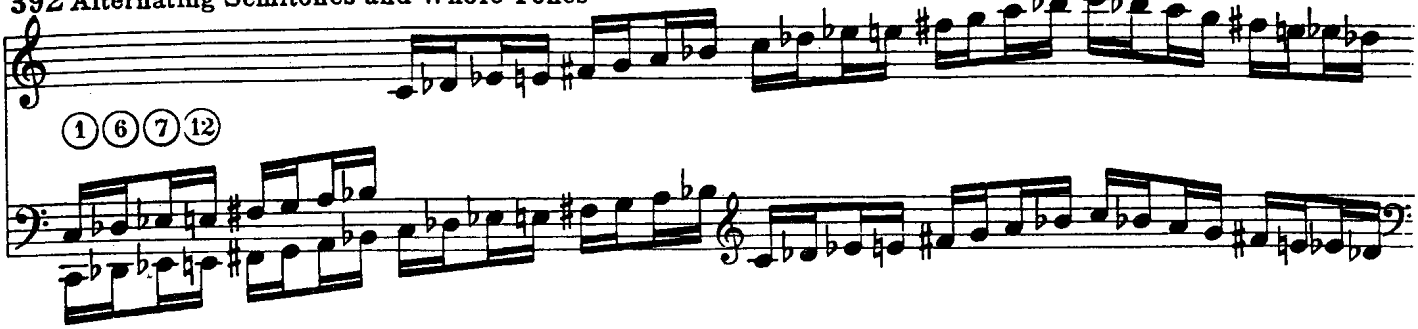
# Sesquitone Progression

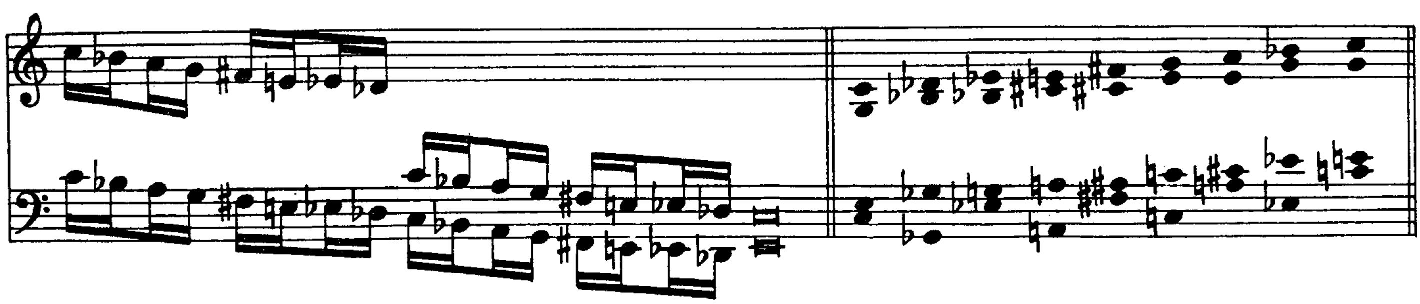
## Equal Division of One Octave into Four Parts
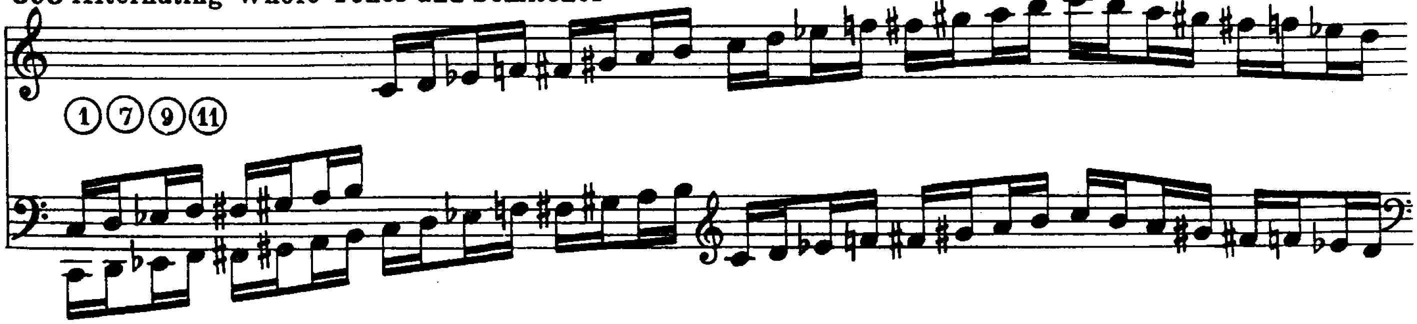


### Interpolation of One Note

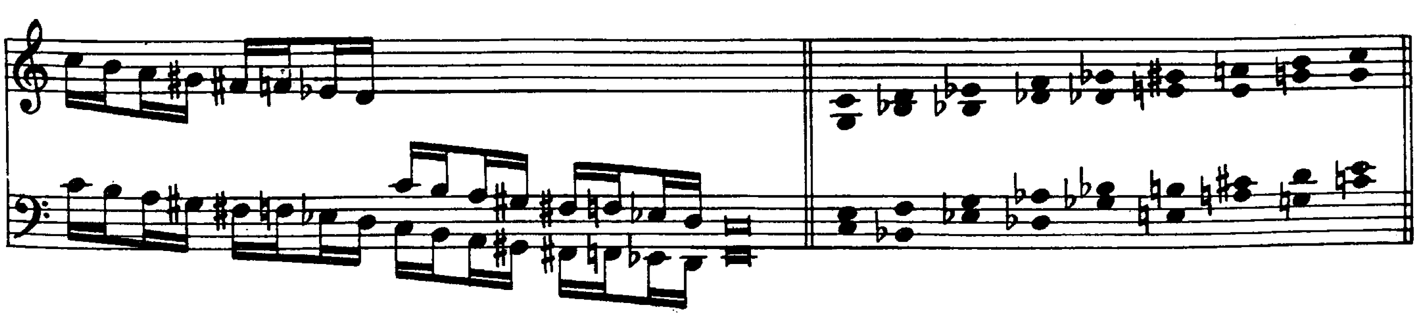
392 **Alternating Semitones and Whole Tones**
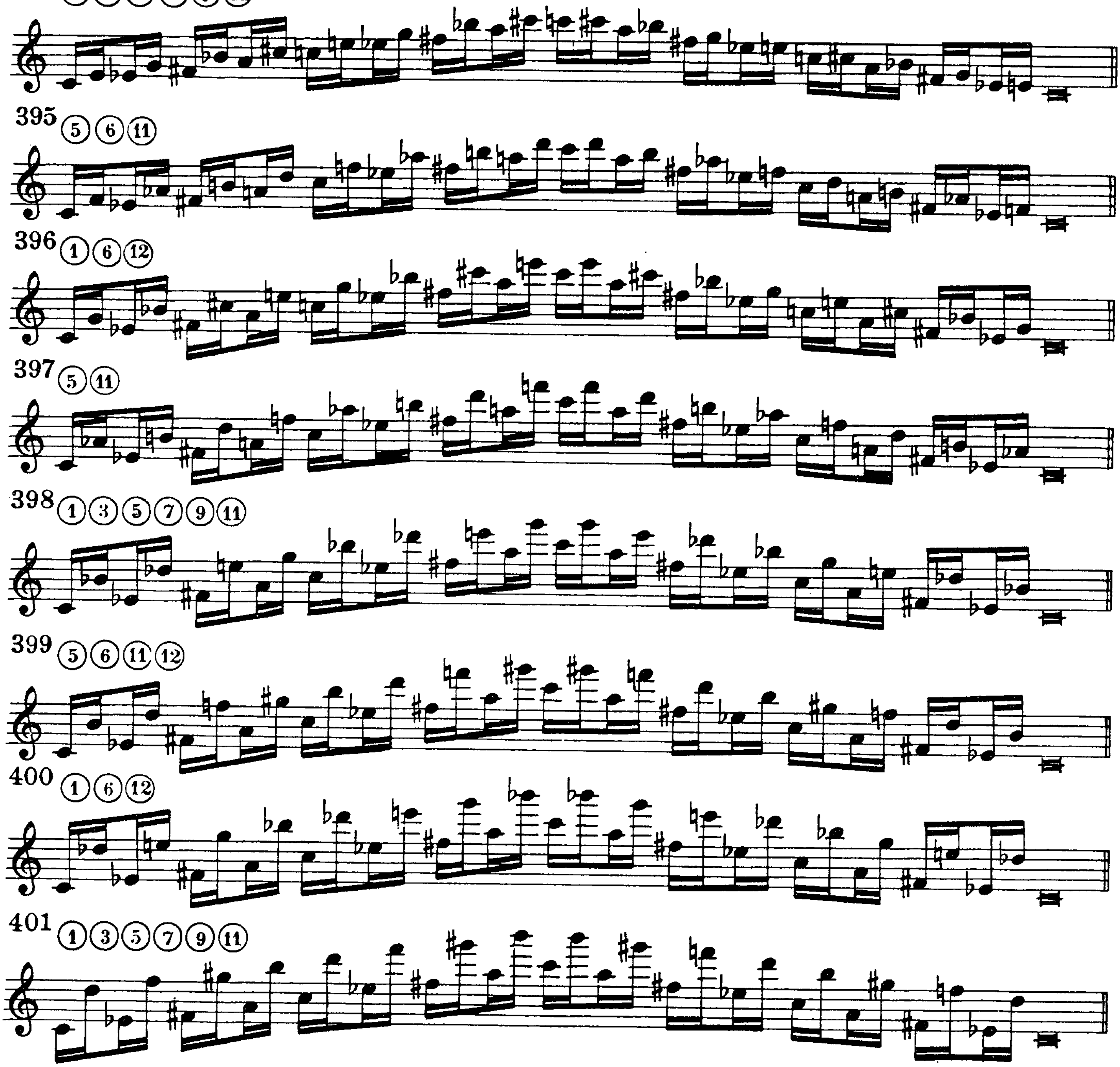


393 **Alternating Whole Tones and Semitones**
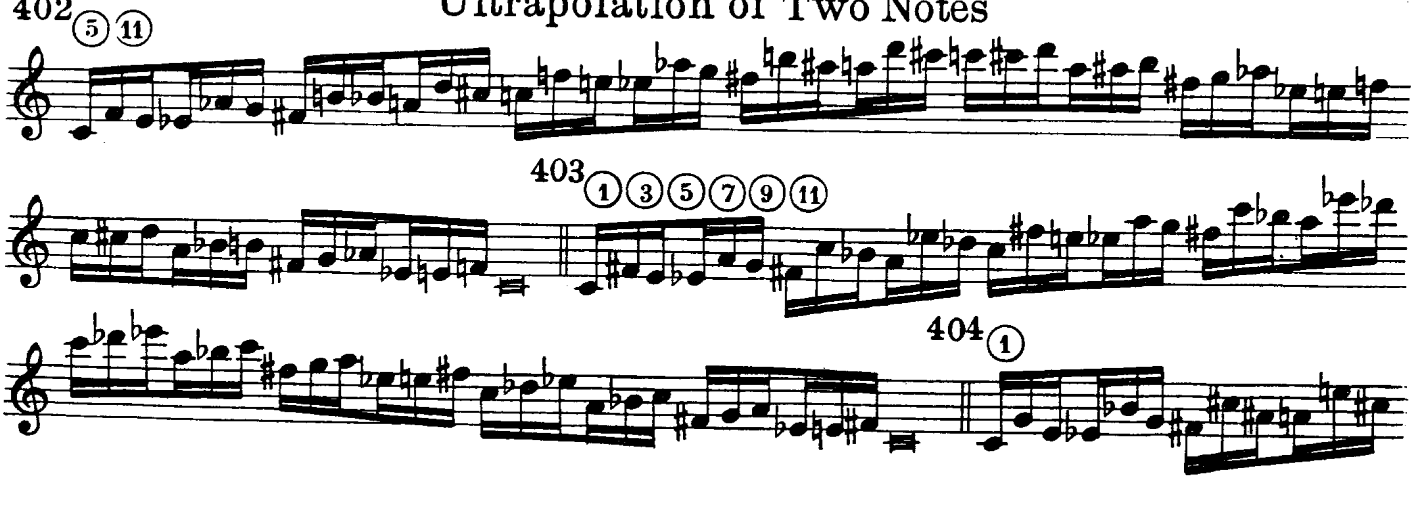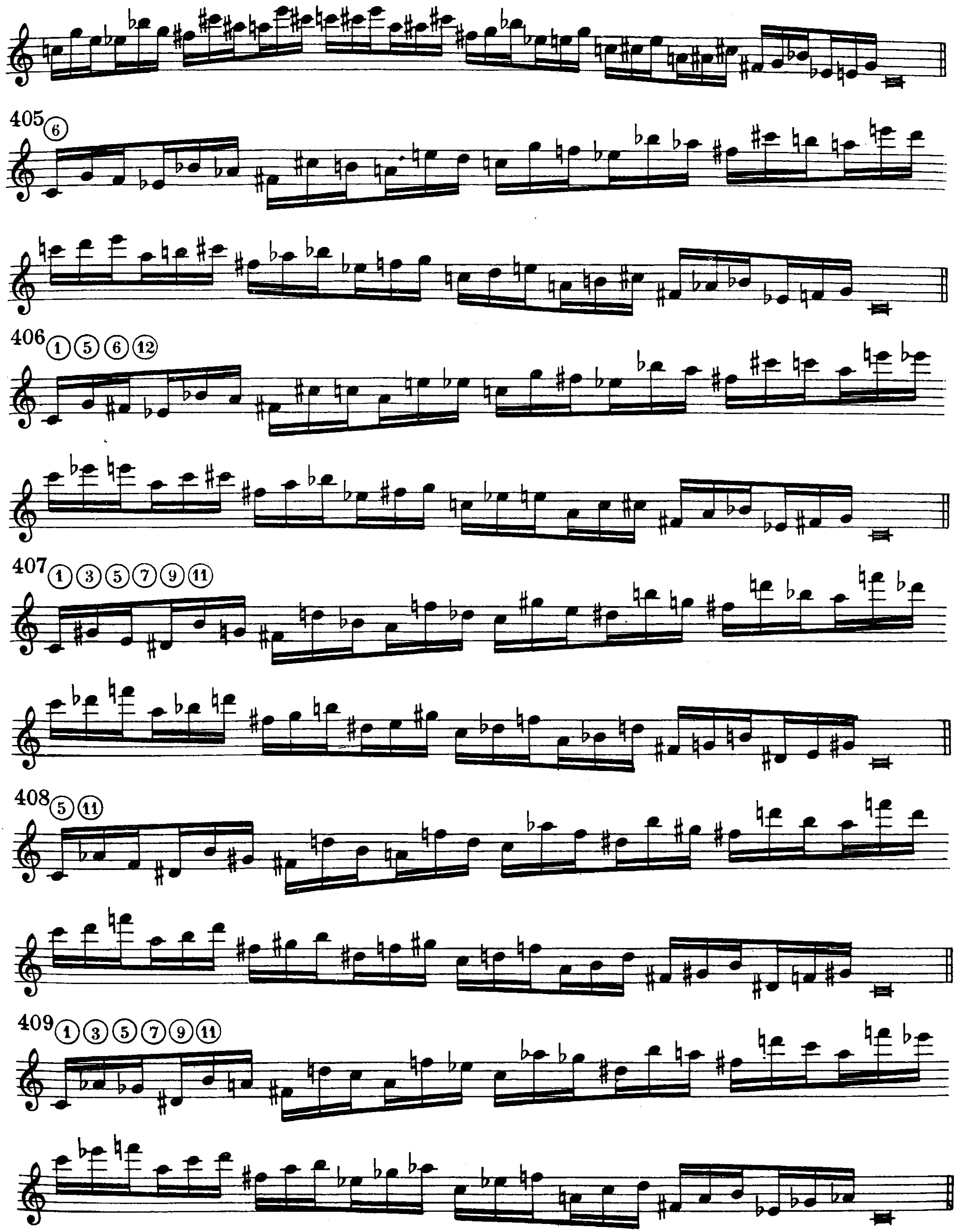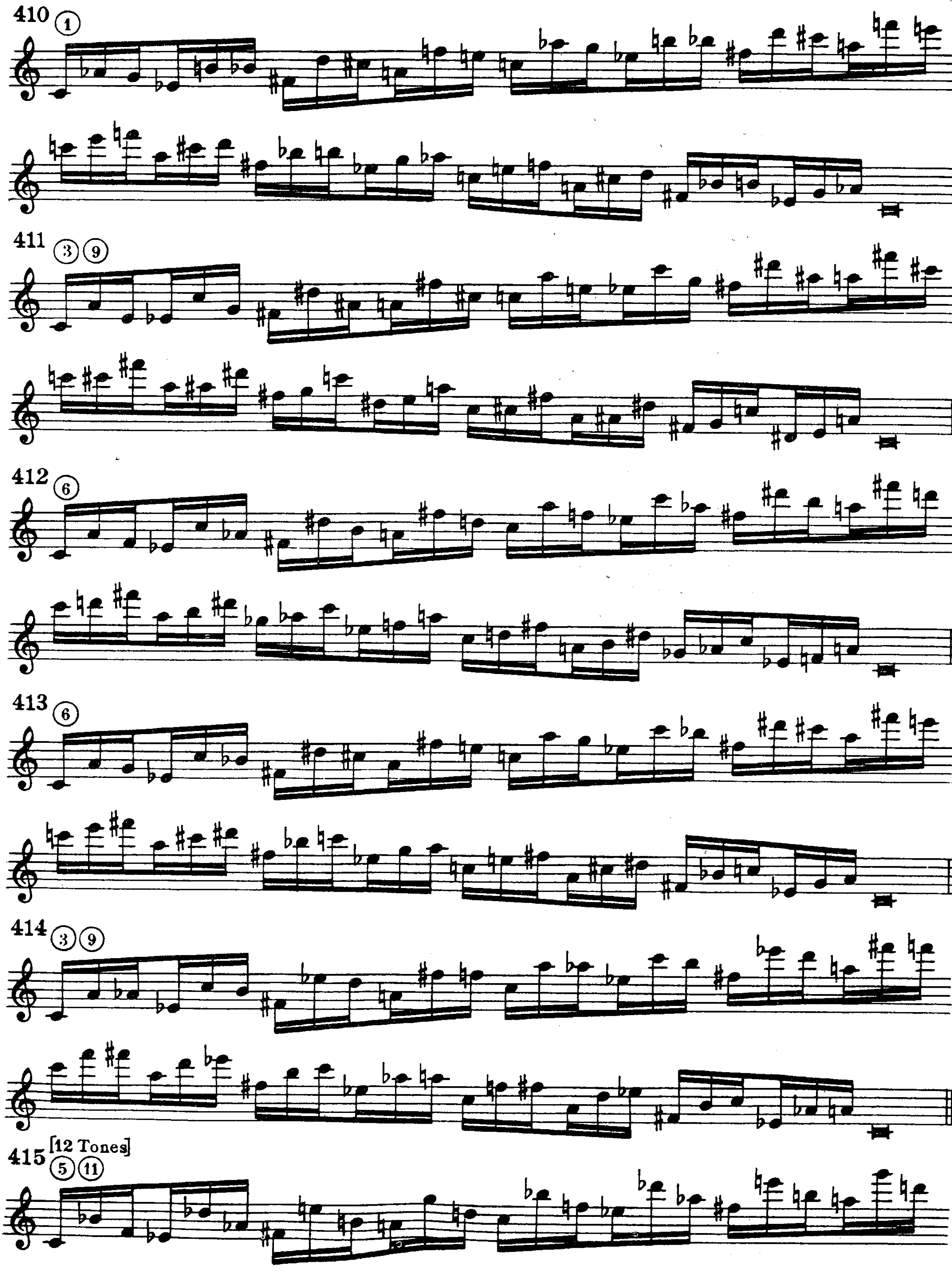


## Ultrapolation of One Note
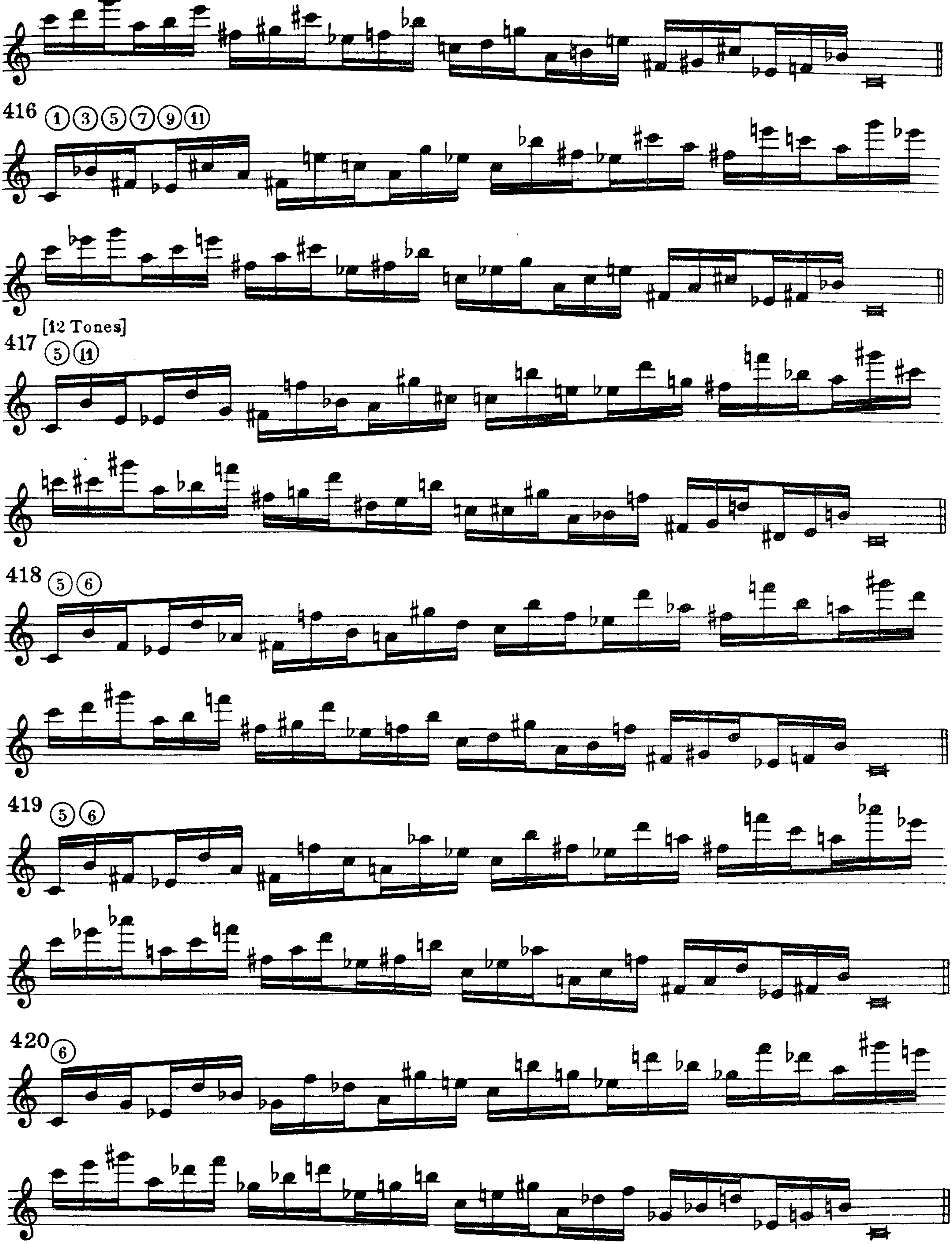



## Ultrapolation of Two Notes

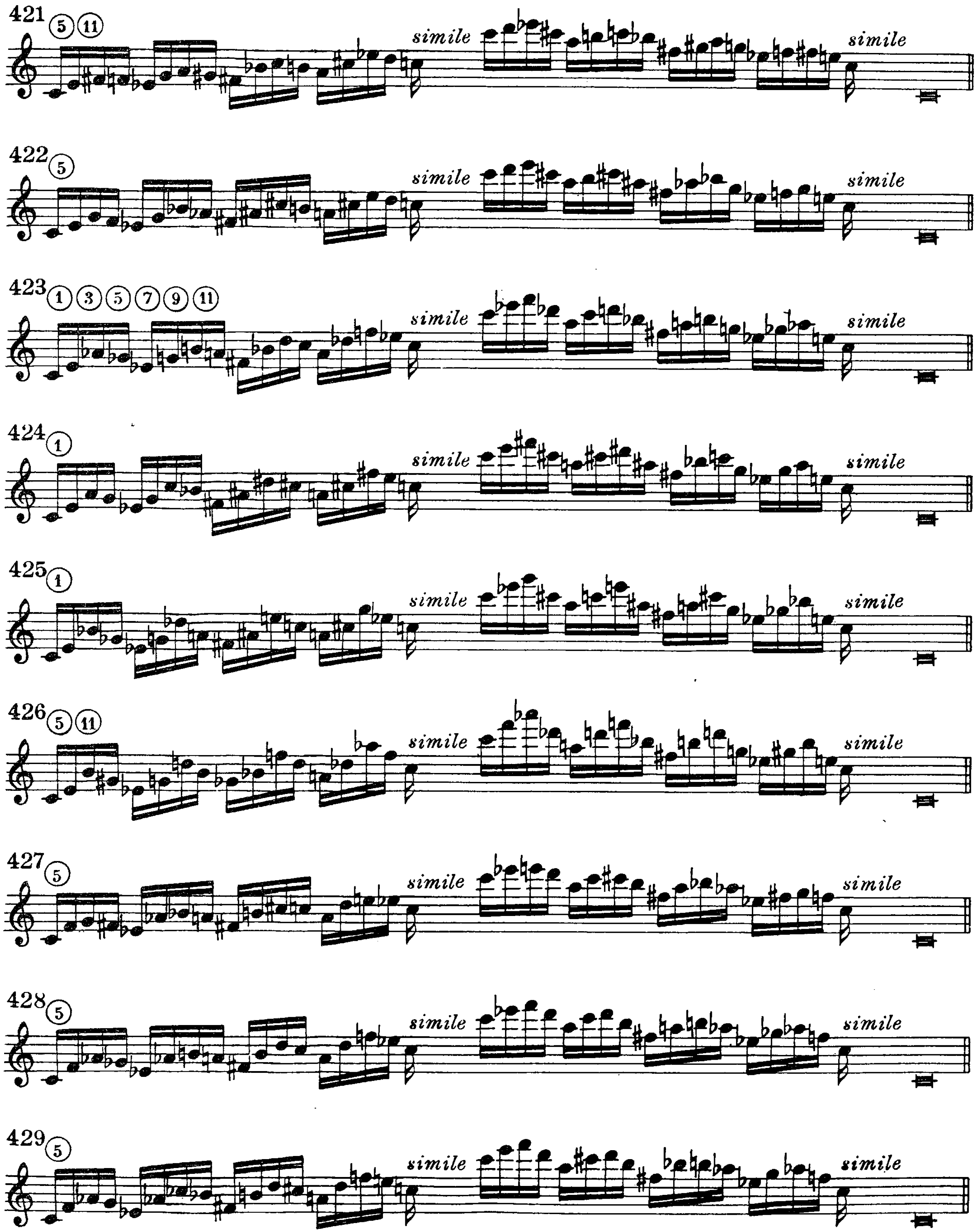


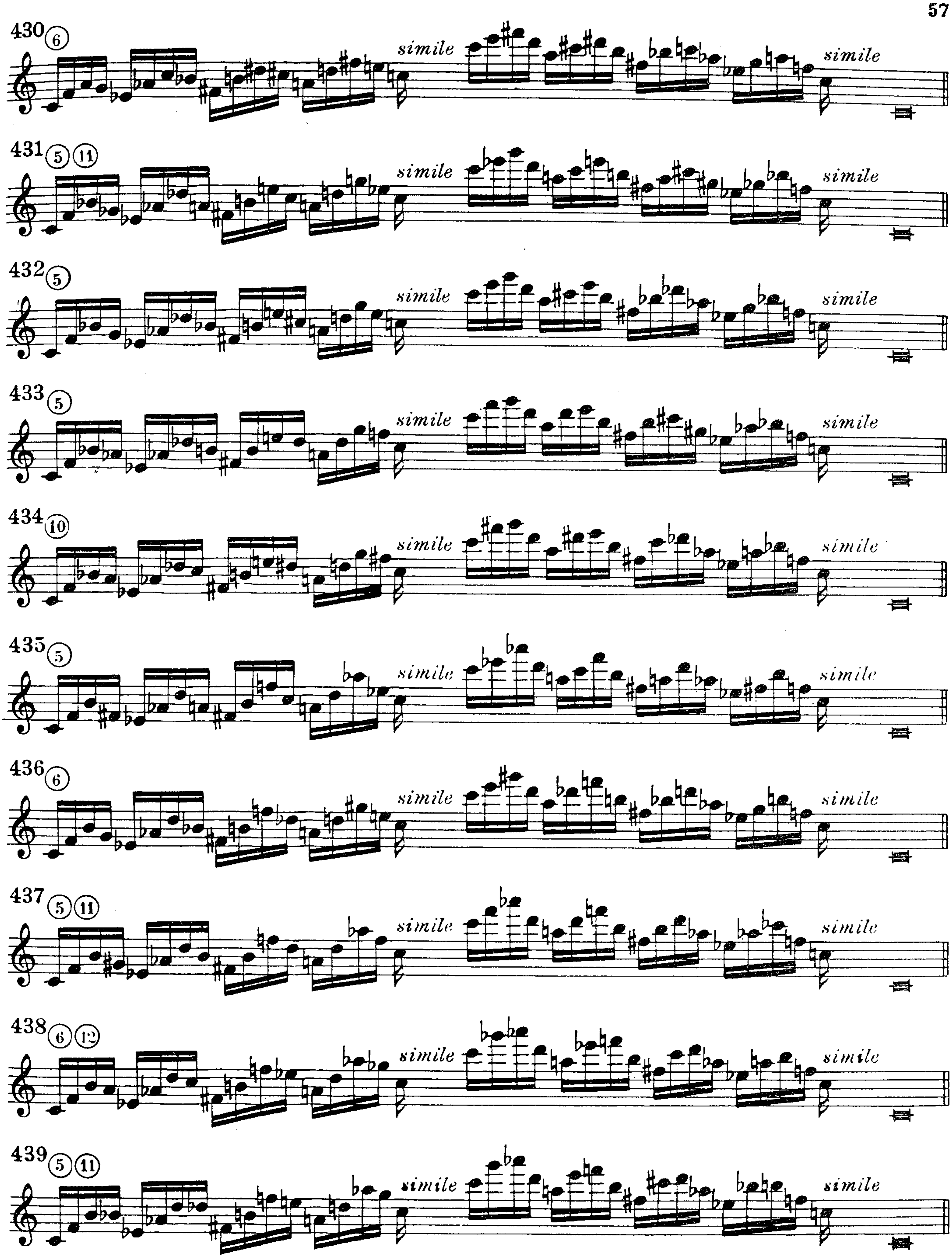

405 ⑥
406 ① ⑤ ⑥ ⑫
407 ① ③ ⑤ ⑦ ⑨ ⑪
408 ⑤ ⑪
409 ① ③ ⑤ ⑦ ⑨ ⑪
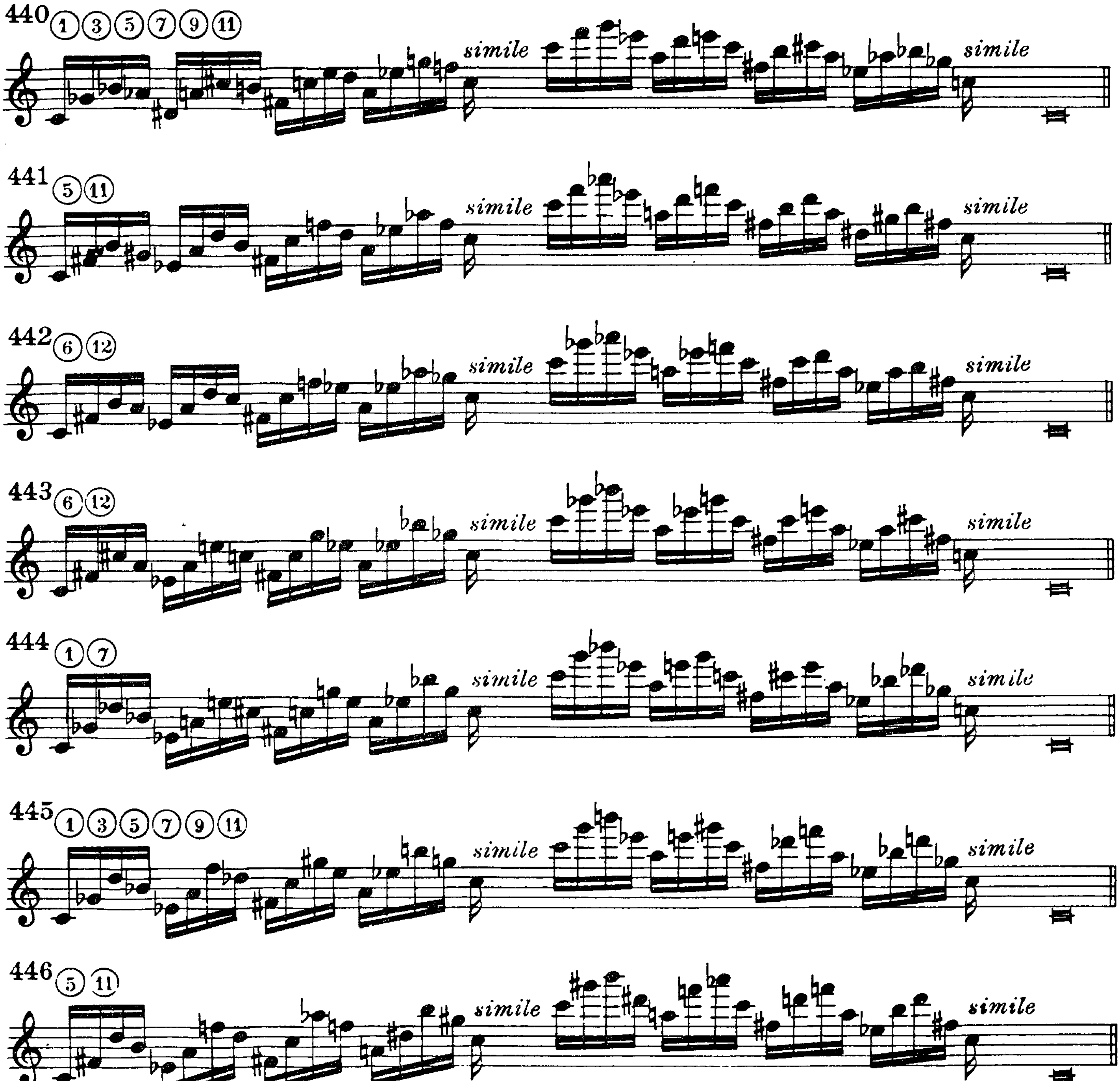

410 ①
411 ③ ⑨
412 ⑥
413 ⑥
414 ③ ⑨
415 [12 Tones] ⑤ ⑪


416 ① ③ ⑤ ⑦ ⑨ ⑪
[12 Tones]
417 ⑤ ⑪
418 ⑤ ⑥
419 ⑤ ⑥
420 ⑥
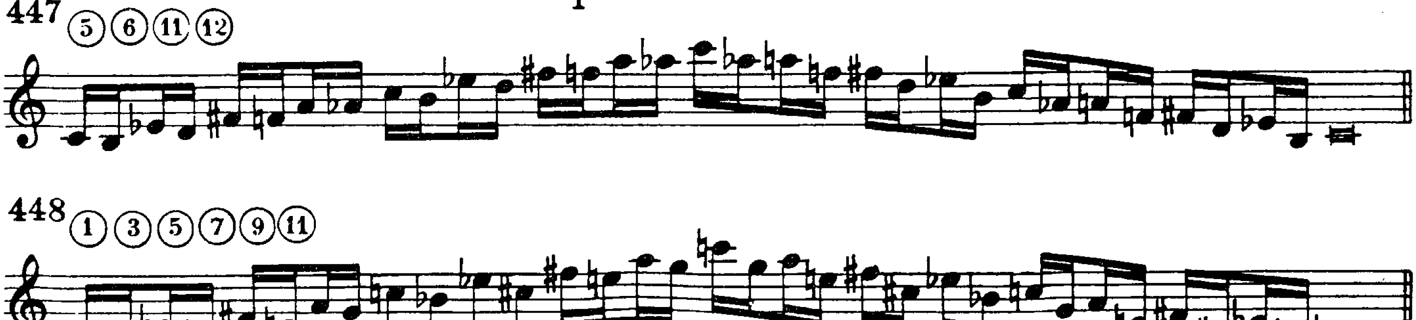
# Ultrapolation of Three Notes
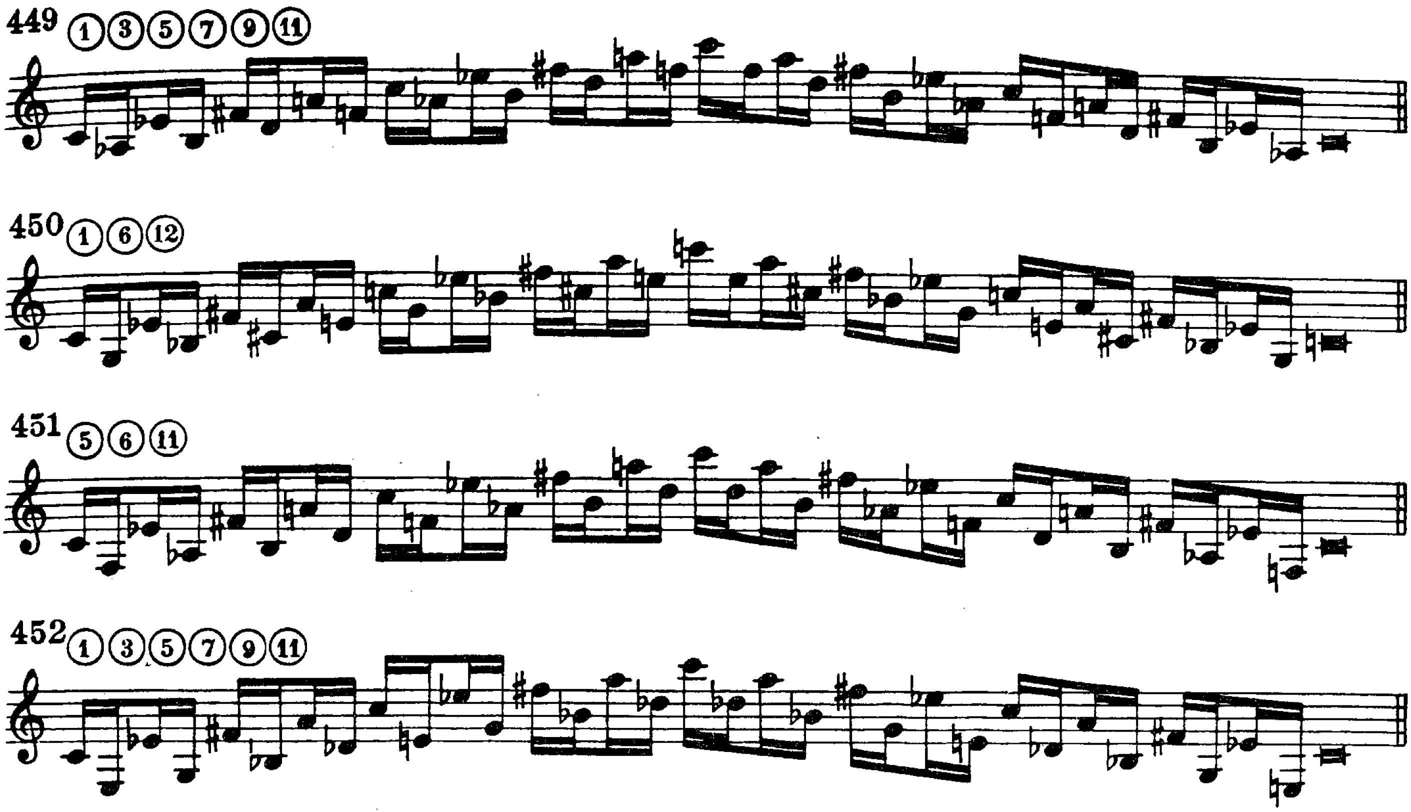



430 (6)
simile
simile
431 (5) (11)
simile
simile
432 (5)
simile
simile
433 (5)
simile
simile
434 (10)
simile
simile
435 (5)
simile
simile
436 (6)
simile
simile
437 (5) (11)
simile
simile
438 (6) (12)
simile
simile
439 (5) (11)
simile
simile
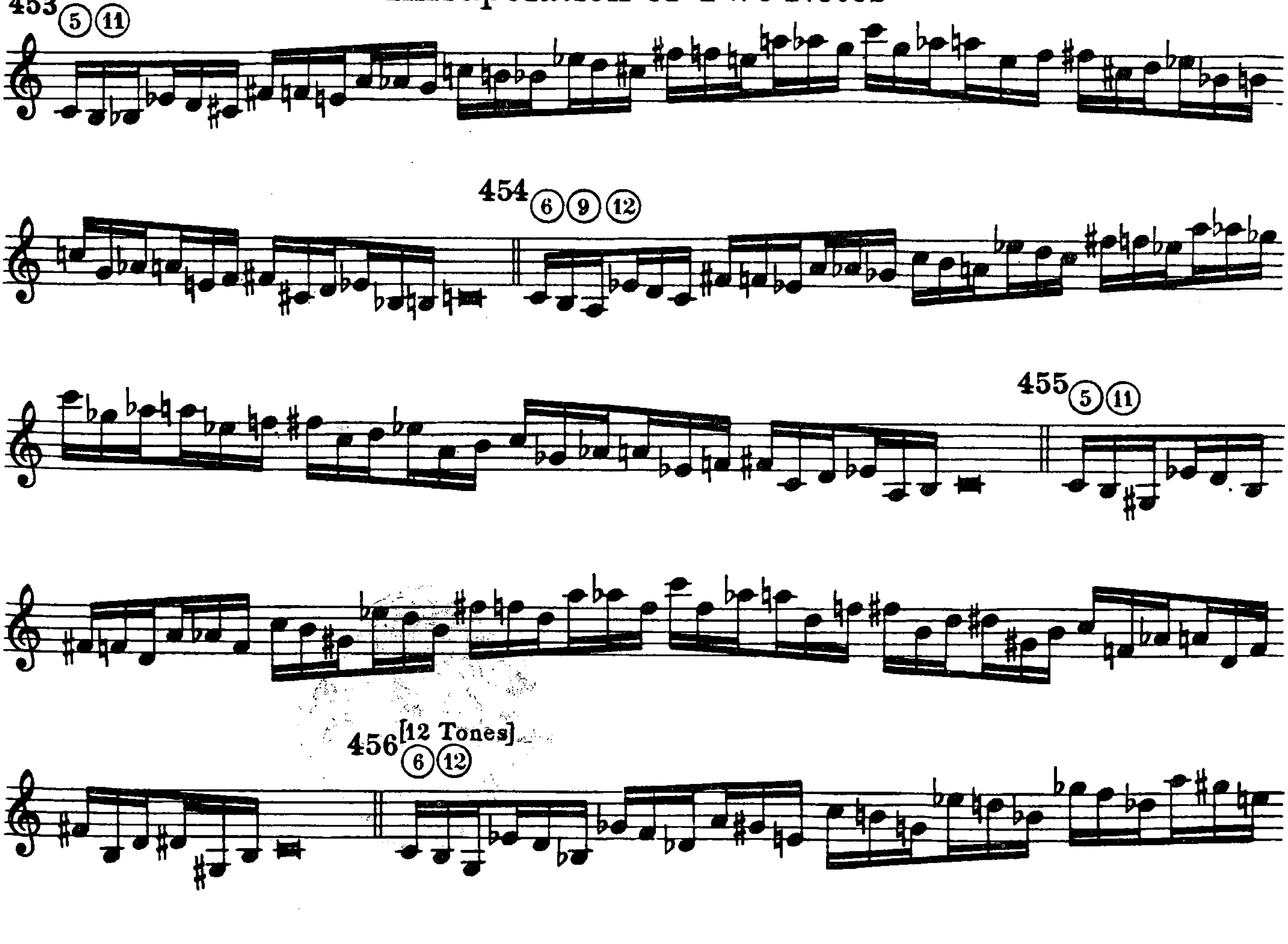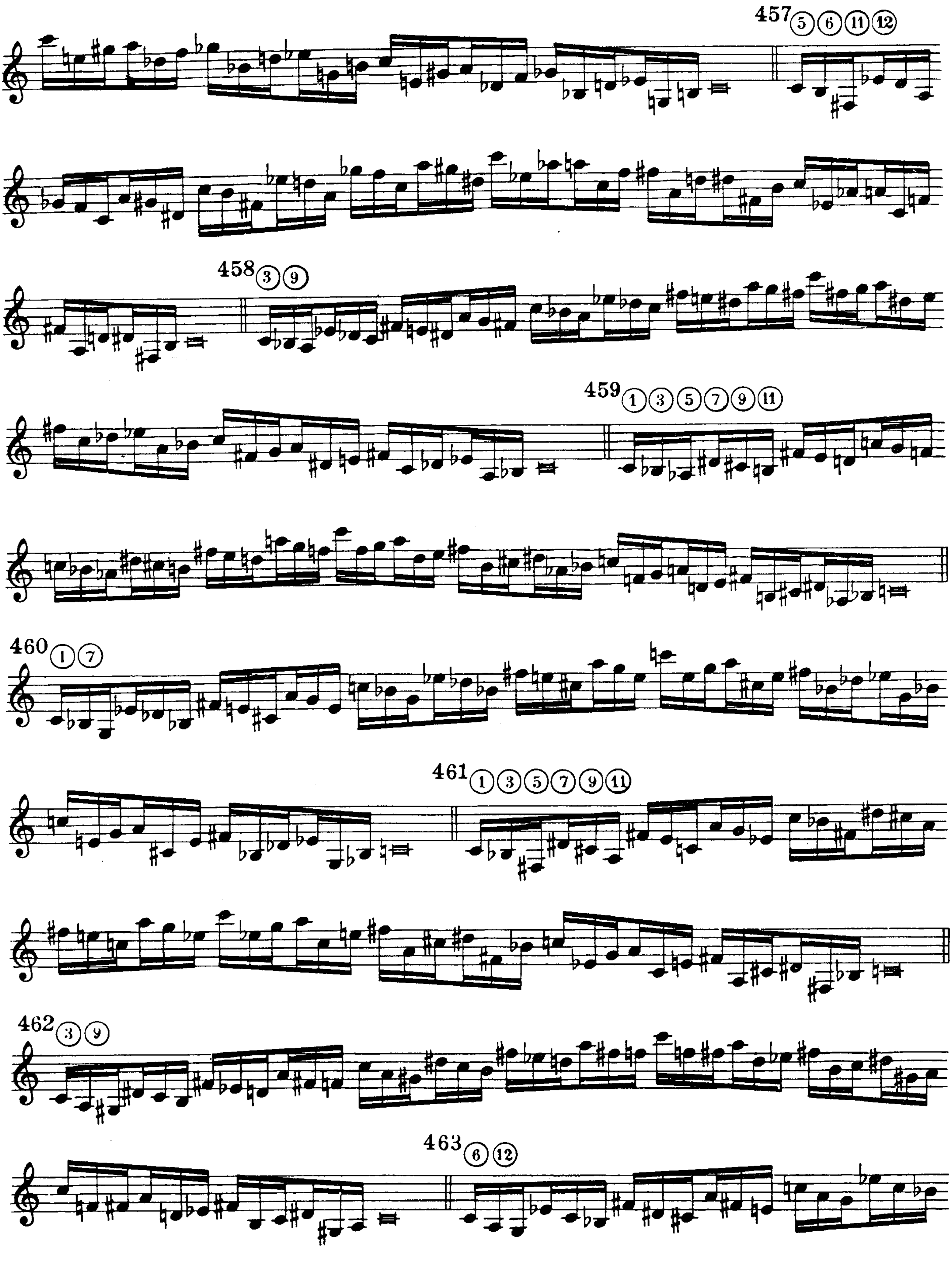



## Infrapolation of One Note

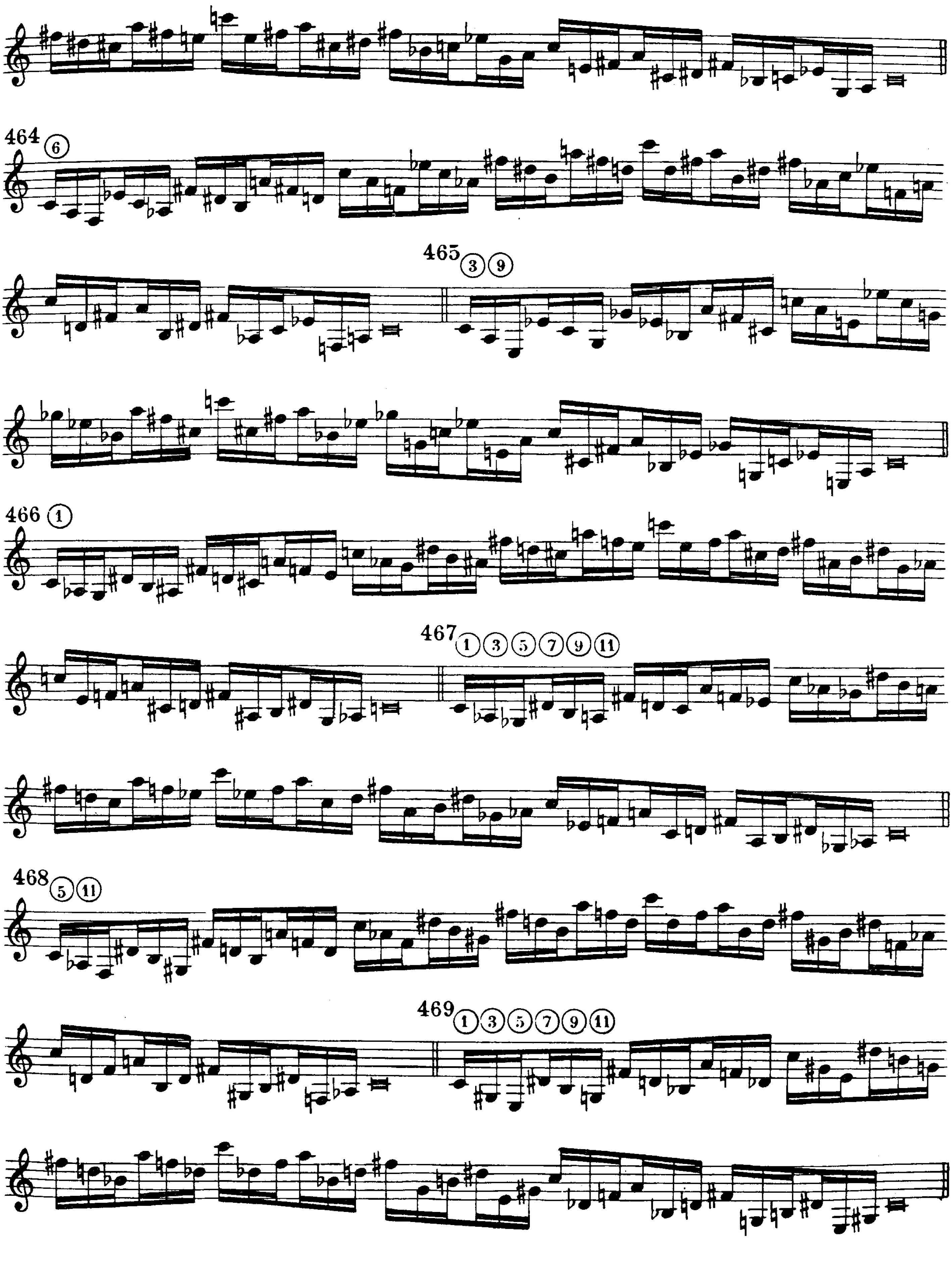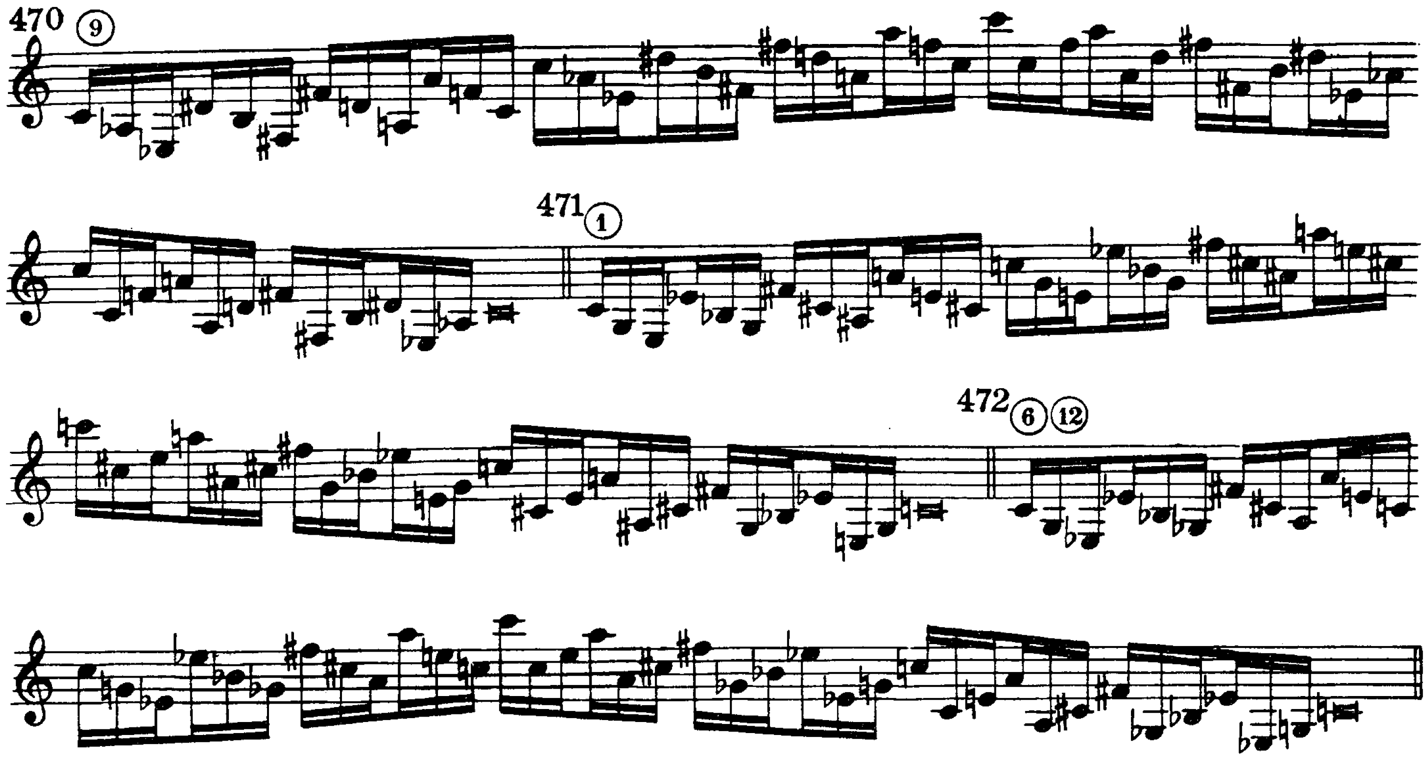





## Infrapolation of Two Notes

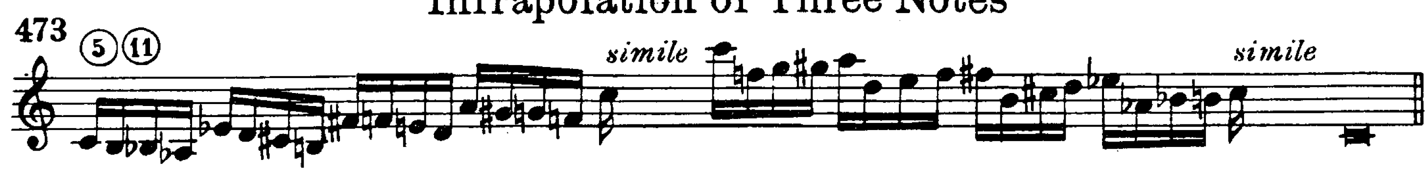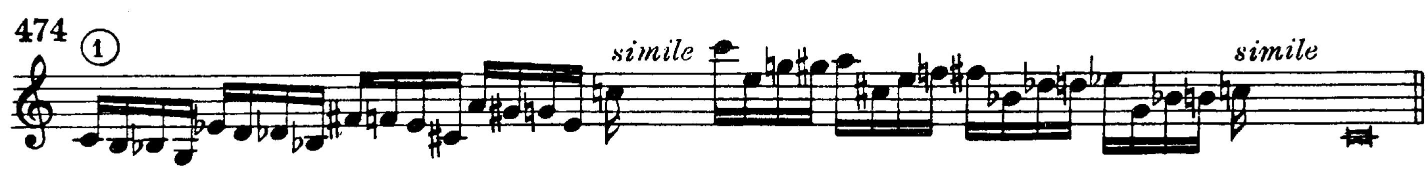



457 ⑤ ⑥ ⑪ ⑫
458 ③ ⑨
459 ① ③ ⑤ ⑦ ⑨ ⑪
460 ① ⑦
461 ① ③ ⑤ ⑦ ⑨ ⑪
462 ③ ⑨
463 ⑥ ⑫


464 6
465 3 9
466 1
467 1 3 5 7 9 11
468 5 11
469 1 3 5 7 9 11
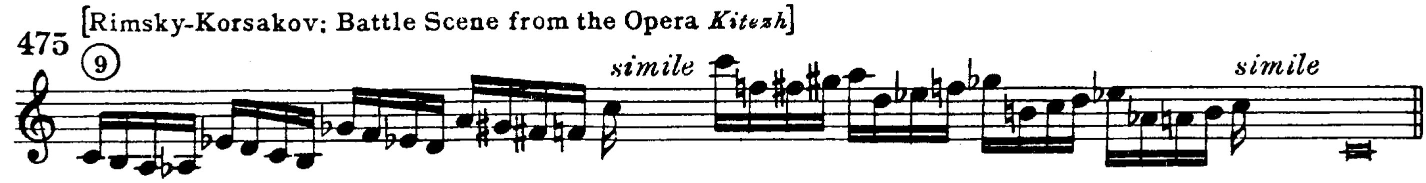



## Infrapolation of Three Notes
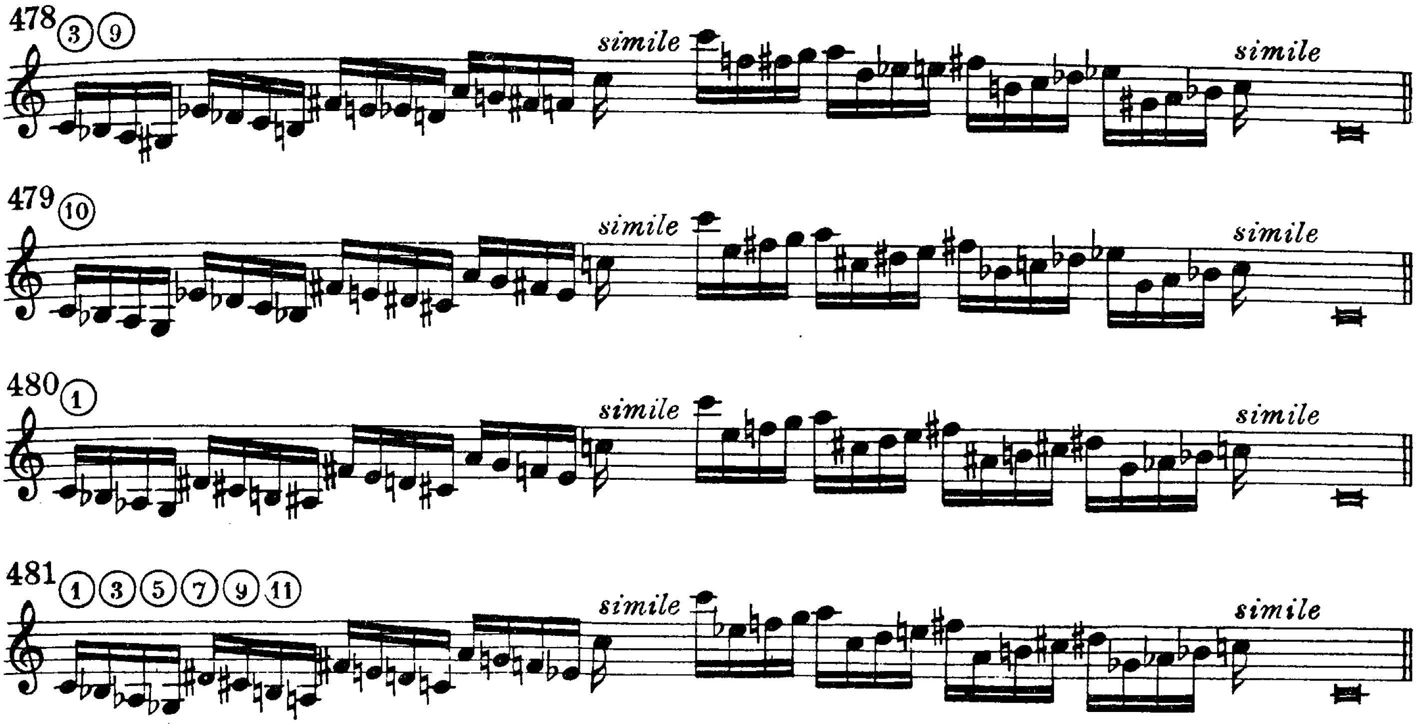
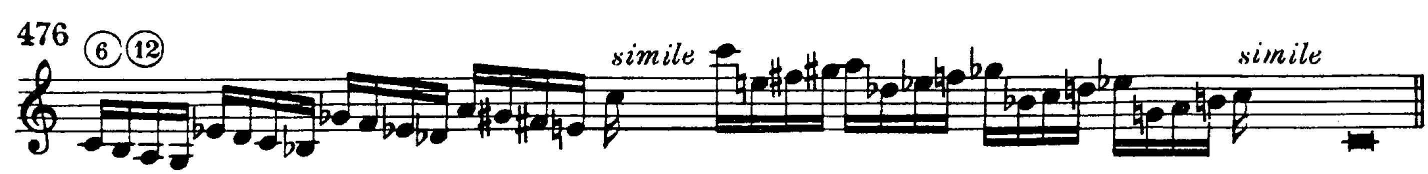






[Rimsky-Korsakov: Battle Scene from the Opera *Kitezh*]



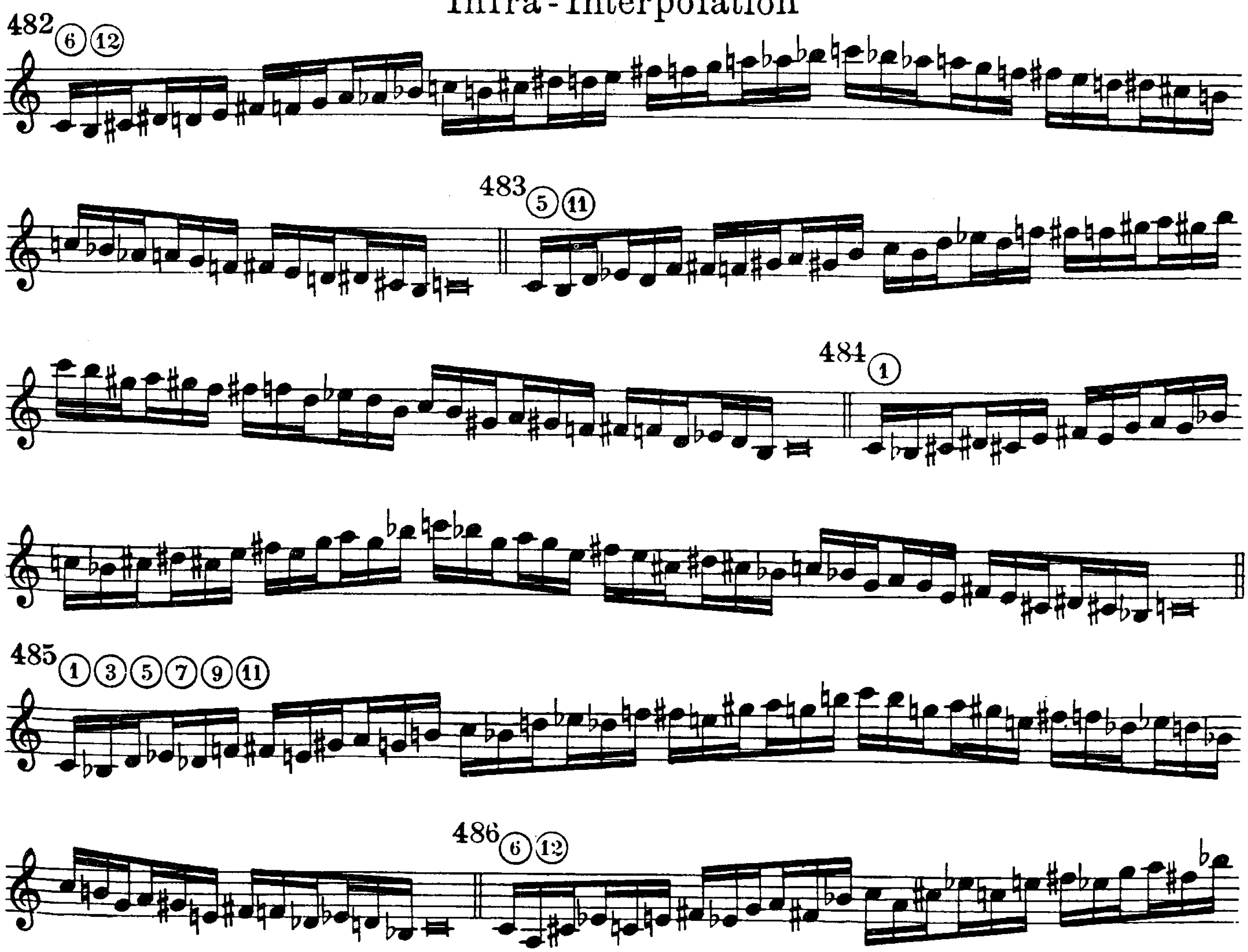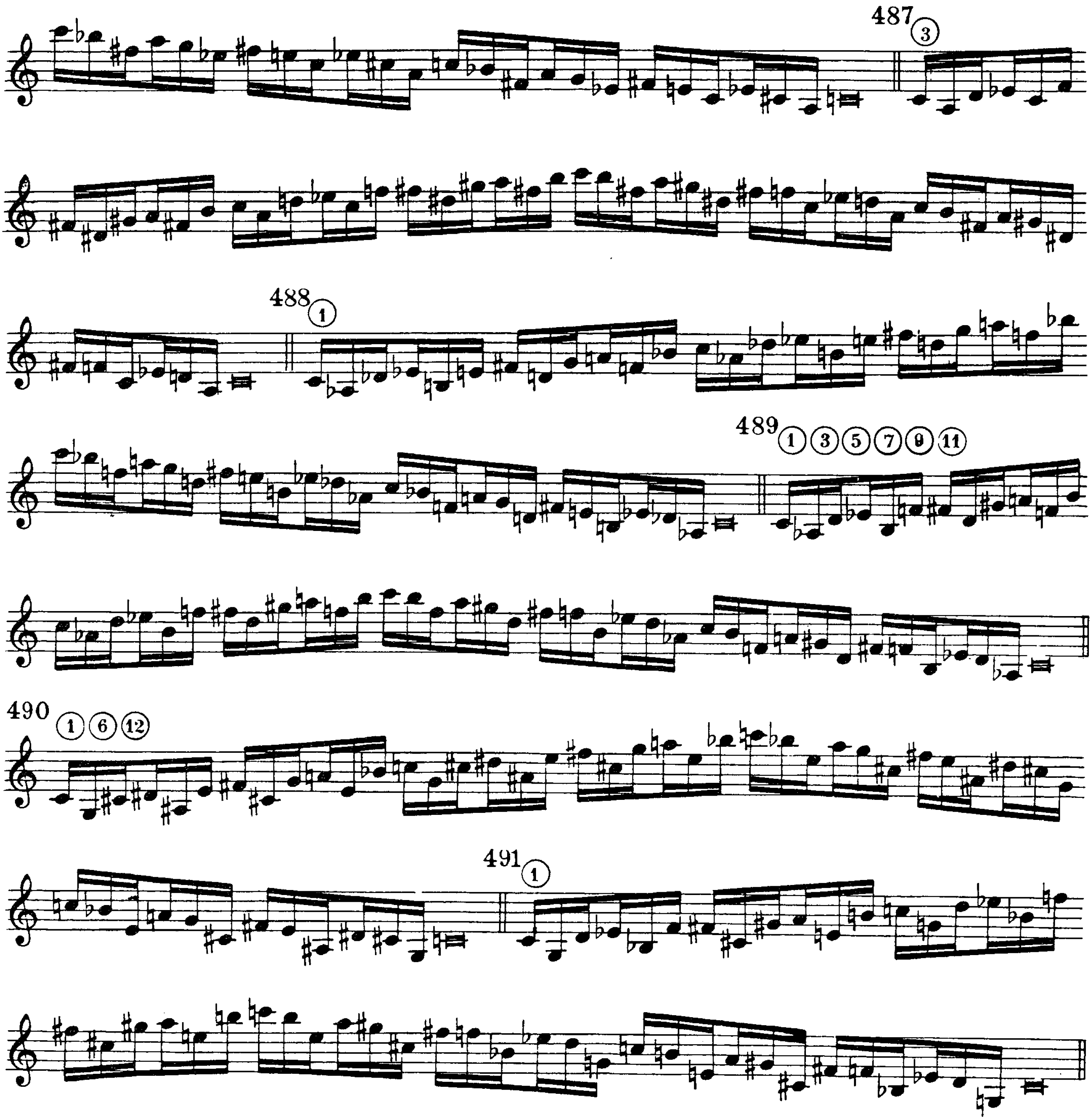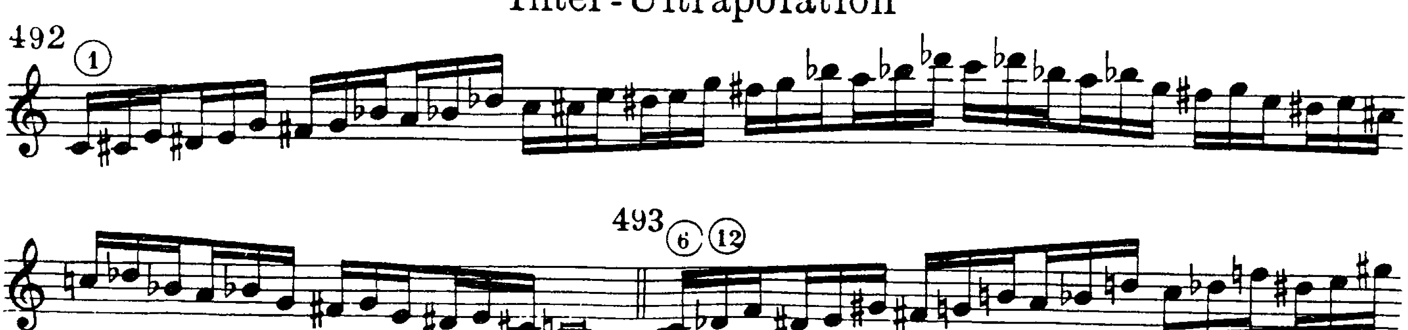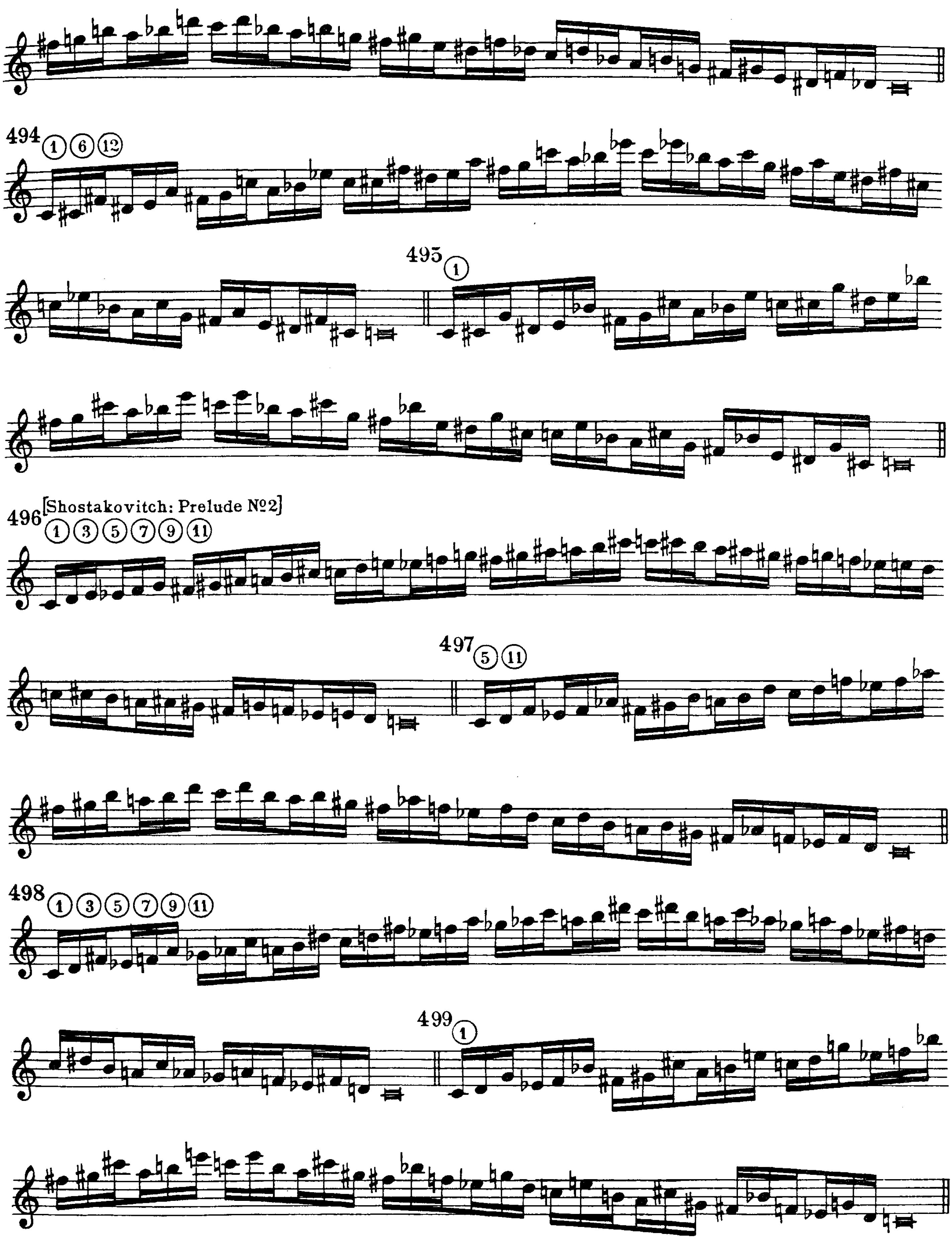









## Infra-Interpolation
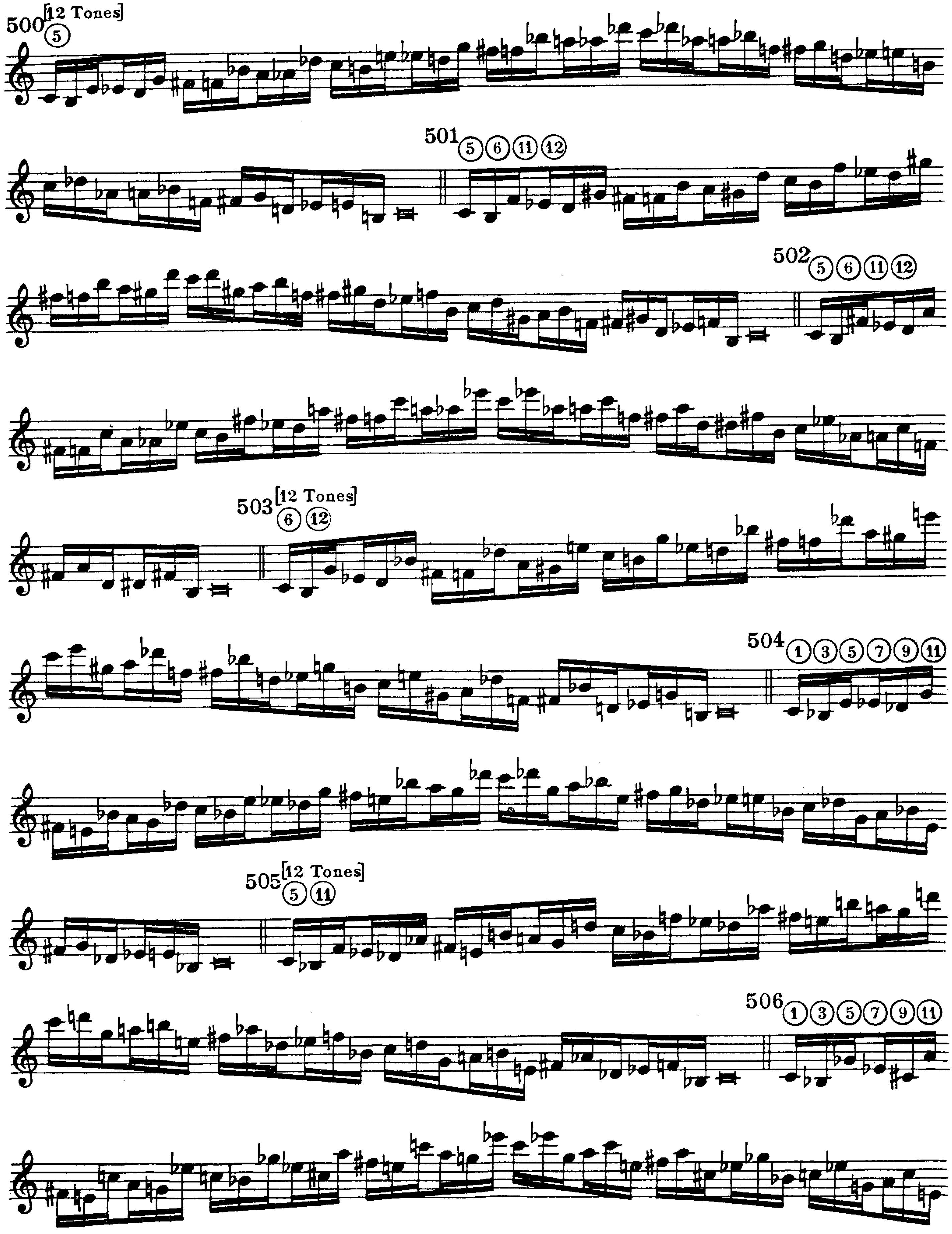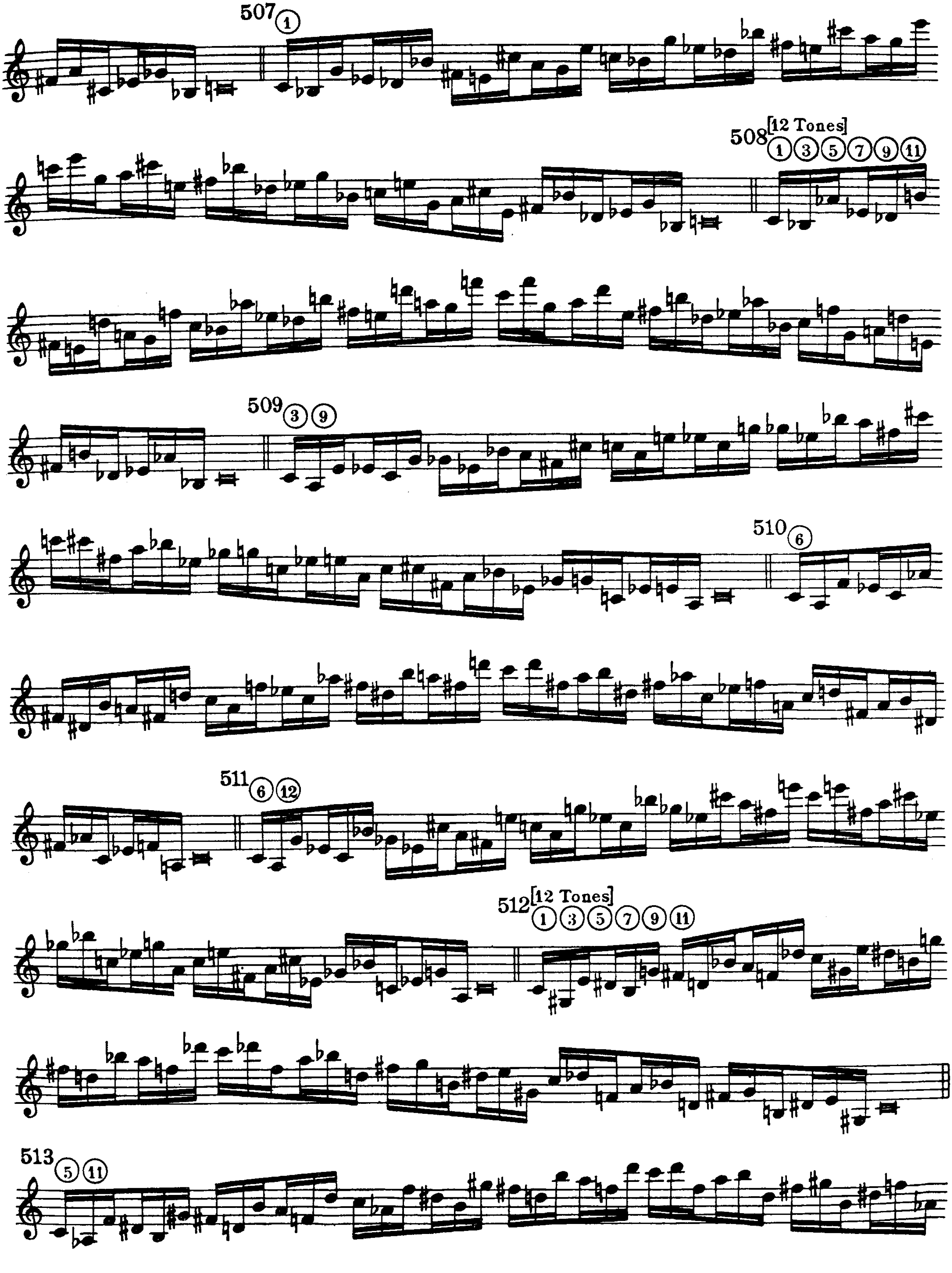





## Inter-Ultrapolation

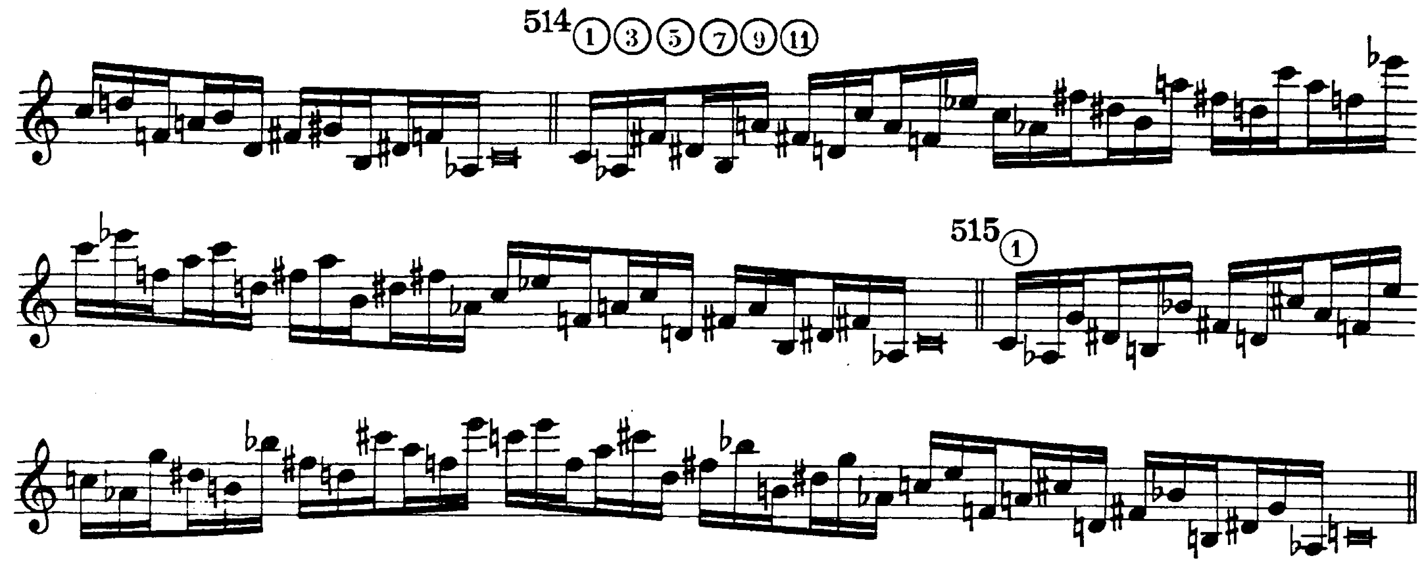



494
495
496
[Shostakovitch: Prelude №2]
497
498
499
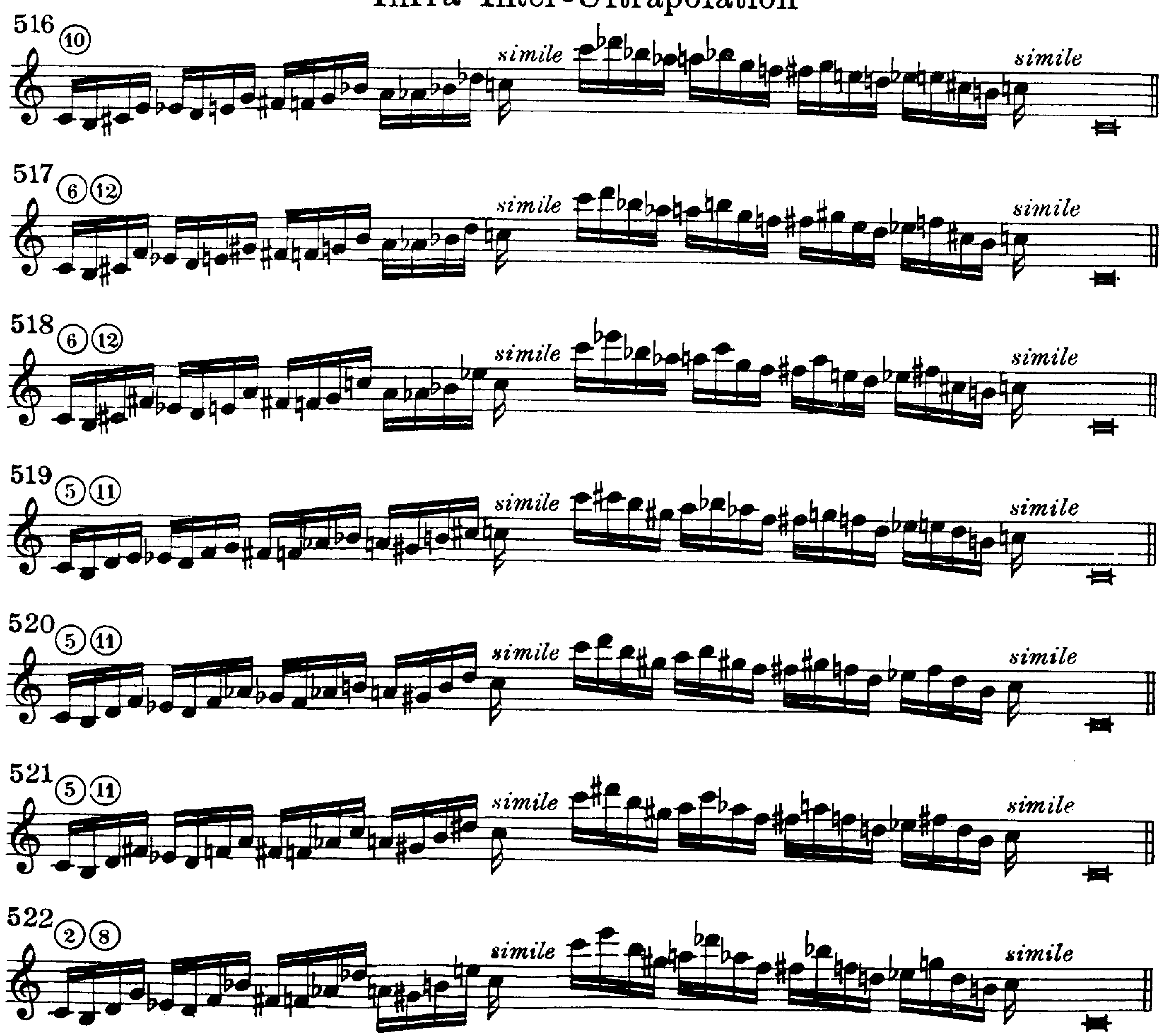
# Infra-Ultrapolation

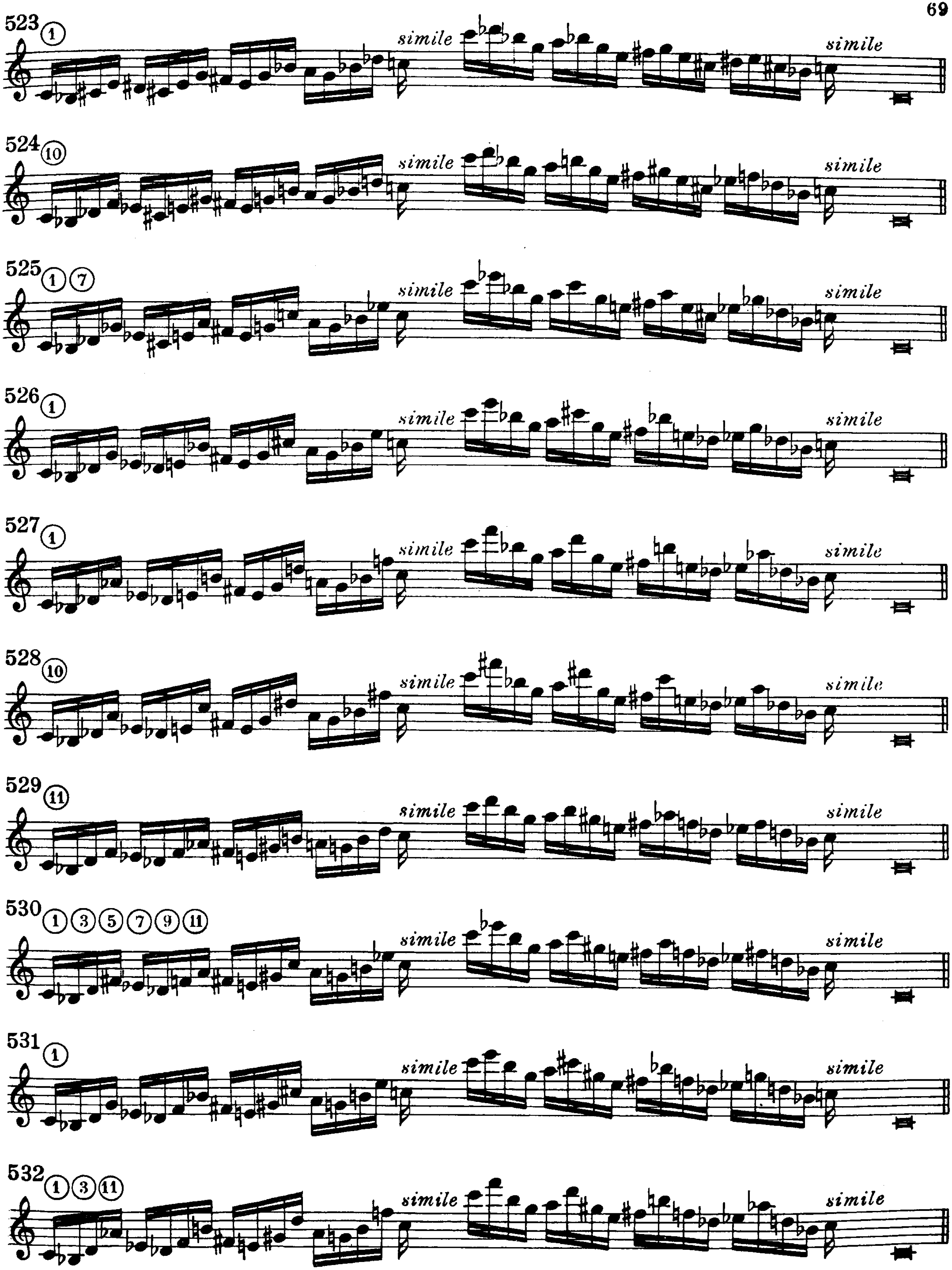


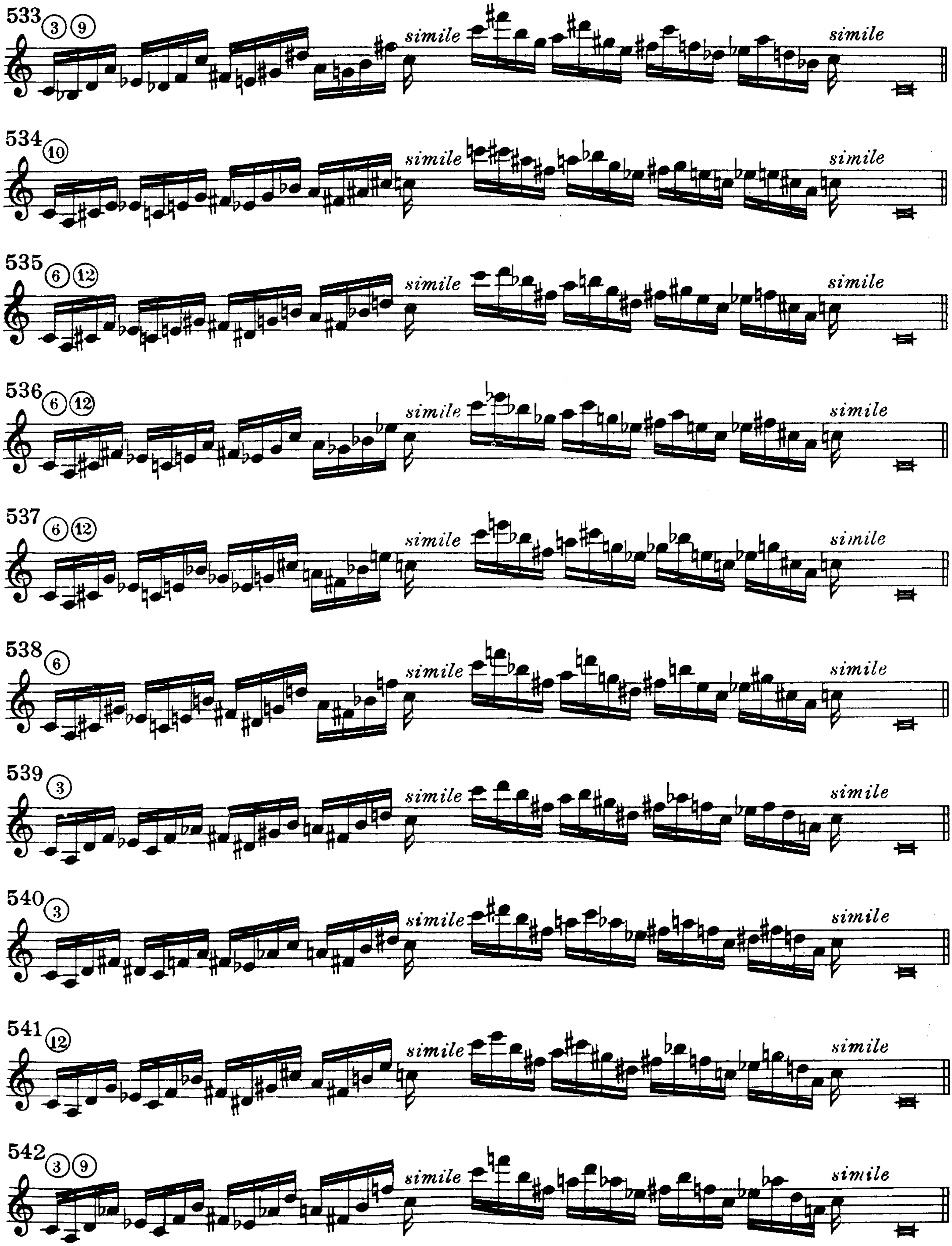

507 ①
508 [12 Tones] ① ③ ⑤ ⑦ ⑨ ⑪
509 ③ ⑨
510 ⑥
511 ⑥ ⑫
512 [12 Tones] ① ③ ⑤ ⑦ ⑨ ⑪
513 ⑤ ⑪
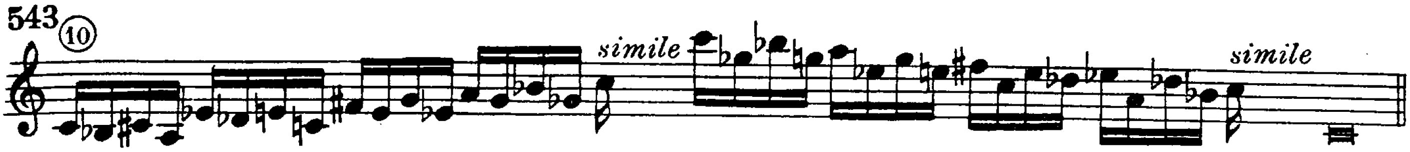



## Infra-Inter-Ultrapolation




523 ① simile simile
524 ⑩ simile simile
525 ① ⑦ simile simile
526 ① simile simile
527 ① simile simile
528 ⑩ simile simile
529 ⑪ simile simile
530 ① ③ ⑤ ⑦ ⑨ ⑪ simile simile
531 ① simile simile
532 ① ③ ⑪ simile simile


533 ③ ⑨ simile simile
534 ⑩ simile simile
535 ⑥ ⑫ simile simile
536 ⑥ ⑫ simile simile
537 ⑥ ⑫ simile simile
538 ⑥ simile simile
539 ③ simile simile
540 ③ simile simile
541 ⑫ simile simile
542 ③ ⑨ simile simile

# Miscellaneous Patterns

543

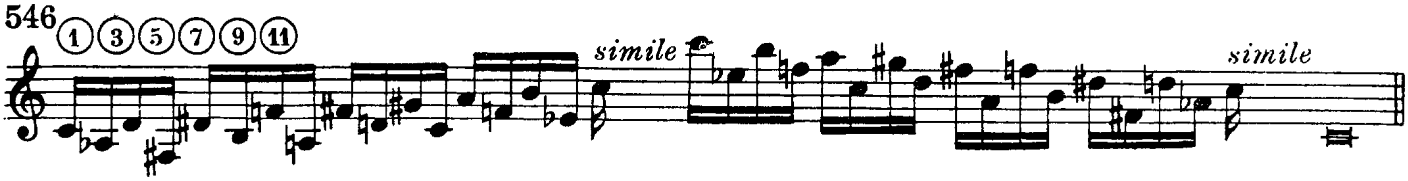


544
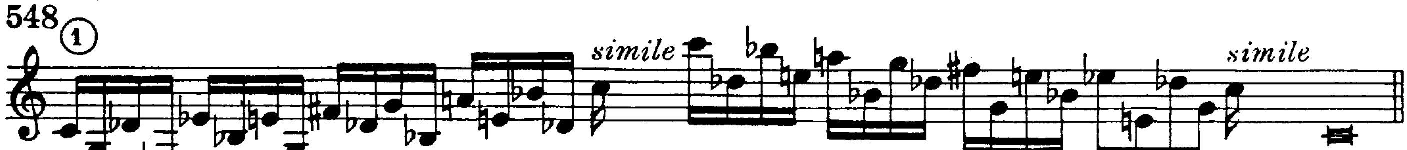


545
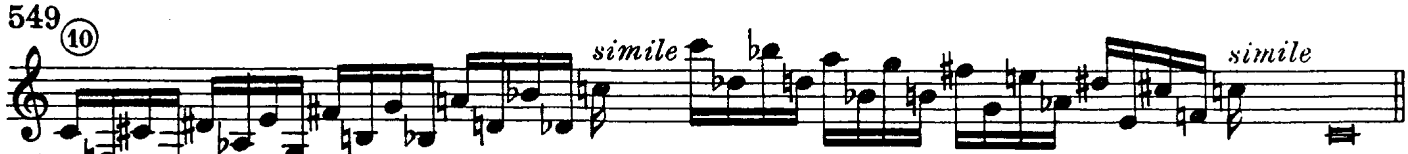


546



547
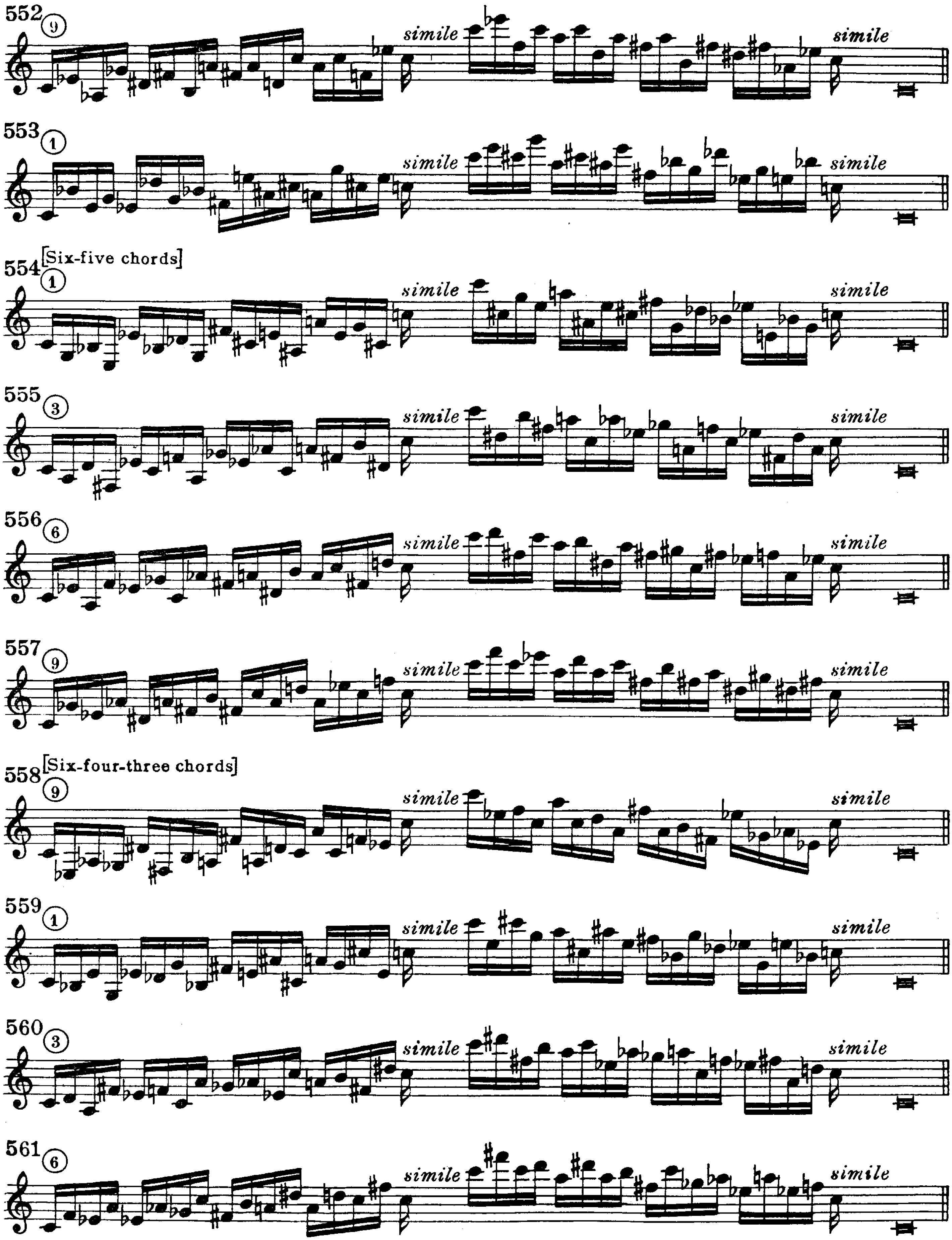


548
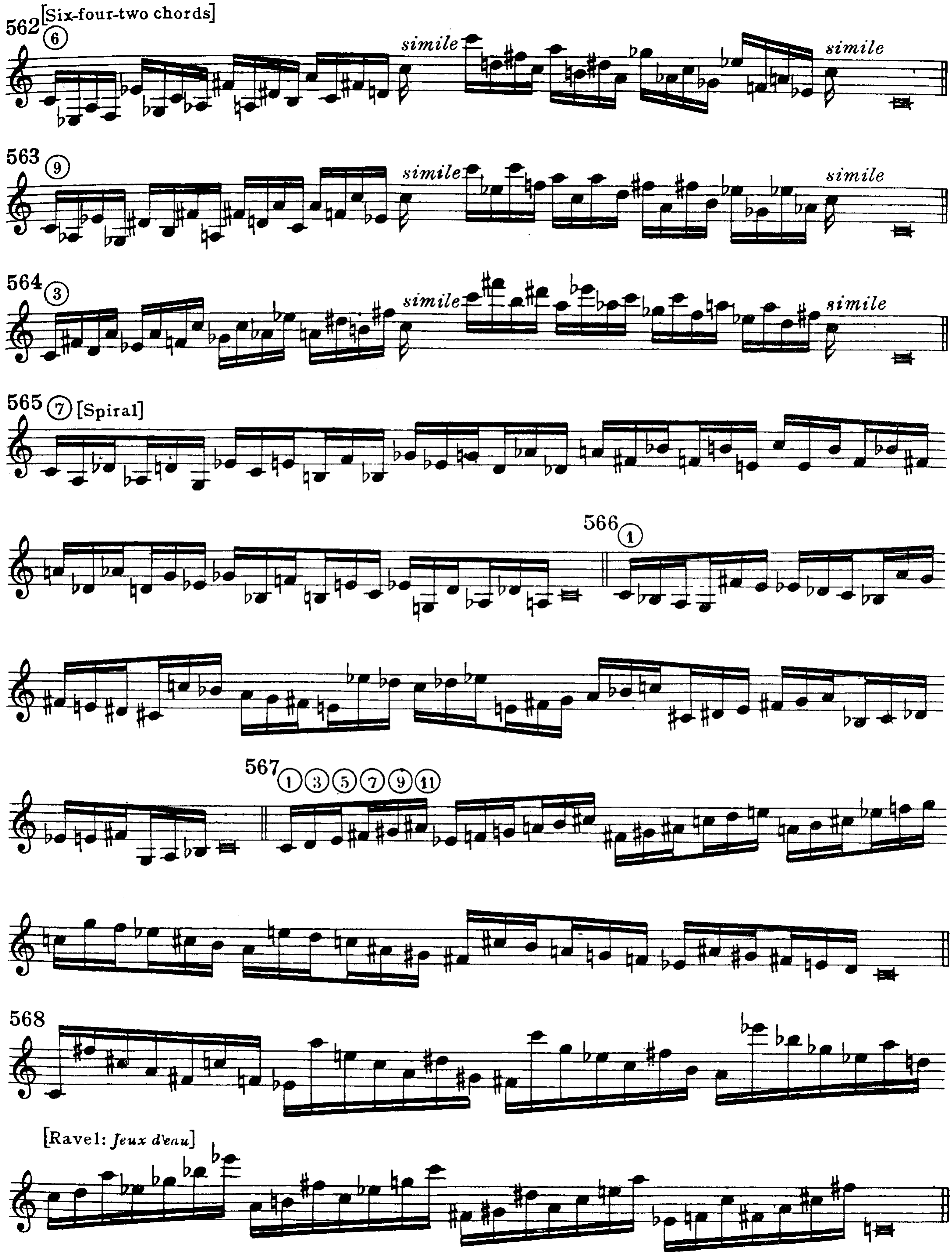


549



550 [Dominant seventh chords]



551

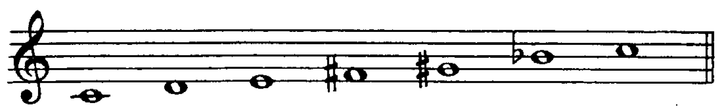


552 9 simile simile
553 1 simile simile
554 [Six-five chords] 1 simile simile
555 3 simile simile
556 6 simile simile
557 9 simile simile
558 [Six-four-three chords] 9 simile simile
559 1 simile simile
560 3 simile simile
561 6 simile simile
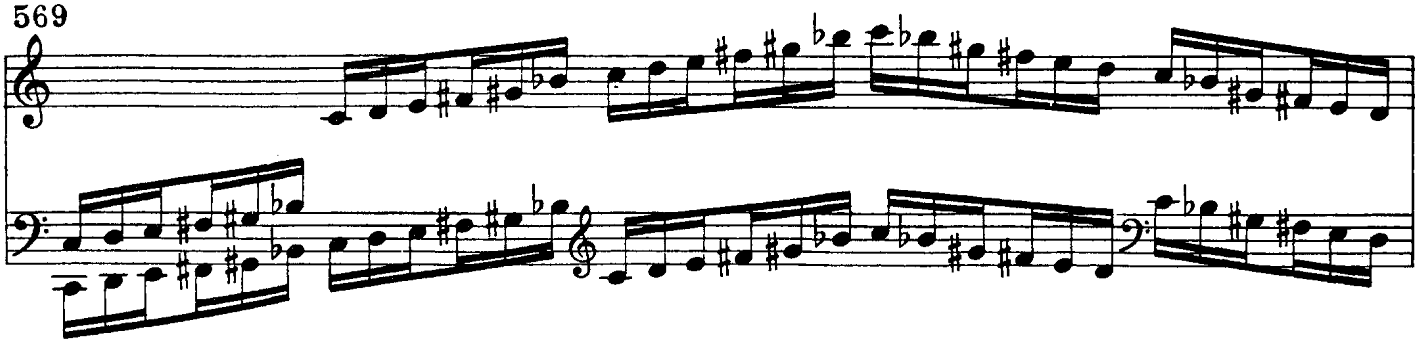

562 [Six-four-two chords] ⑥
simile
simile
563 ⑨
simile
simile
564 ③
simile
simile
565 ⑦ [Spiral]
566 ①
567 ① ③ ⑤ ⑦ ⑨ ⑪
568
[Ravel: Jeux d'eau]
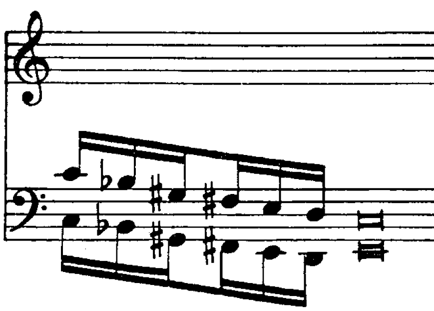
# Whole-Tone Progression

## Equal Division of One Octave into Six Parts
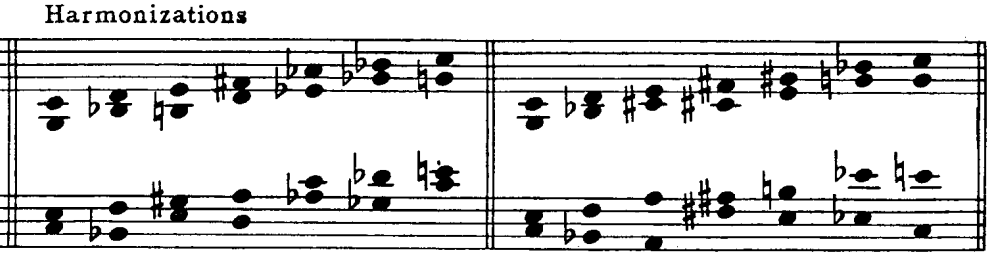


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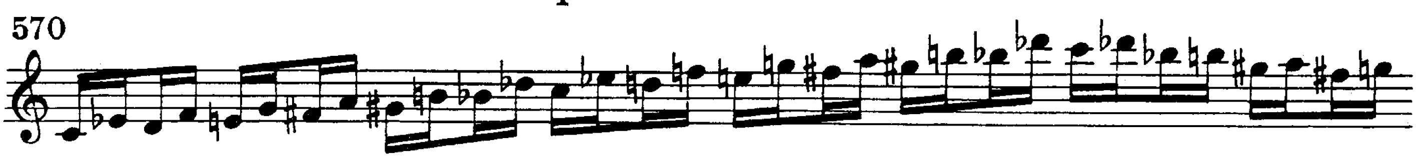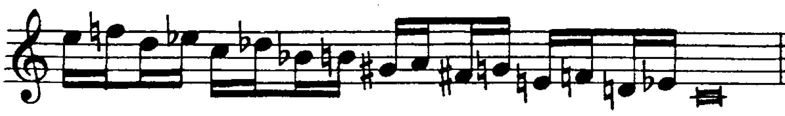




Harmonizations



## Ultrapolation of One Note
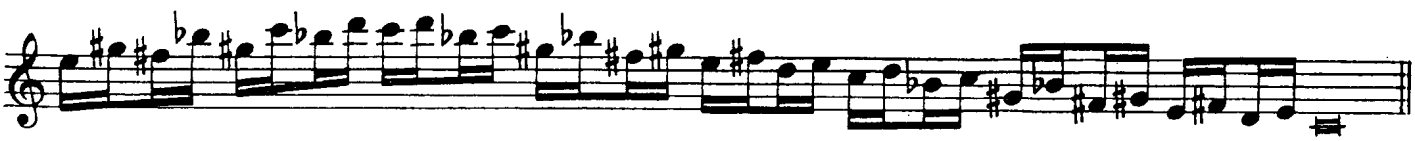
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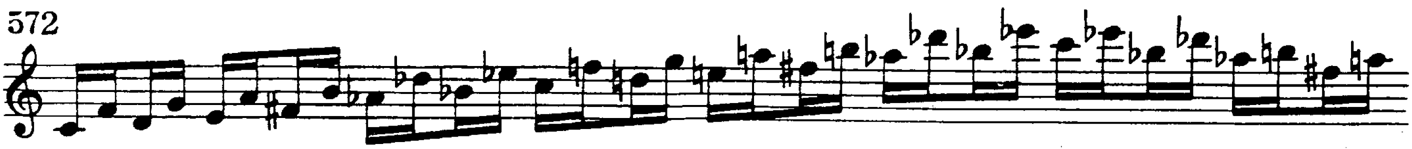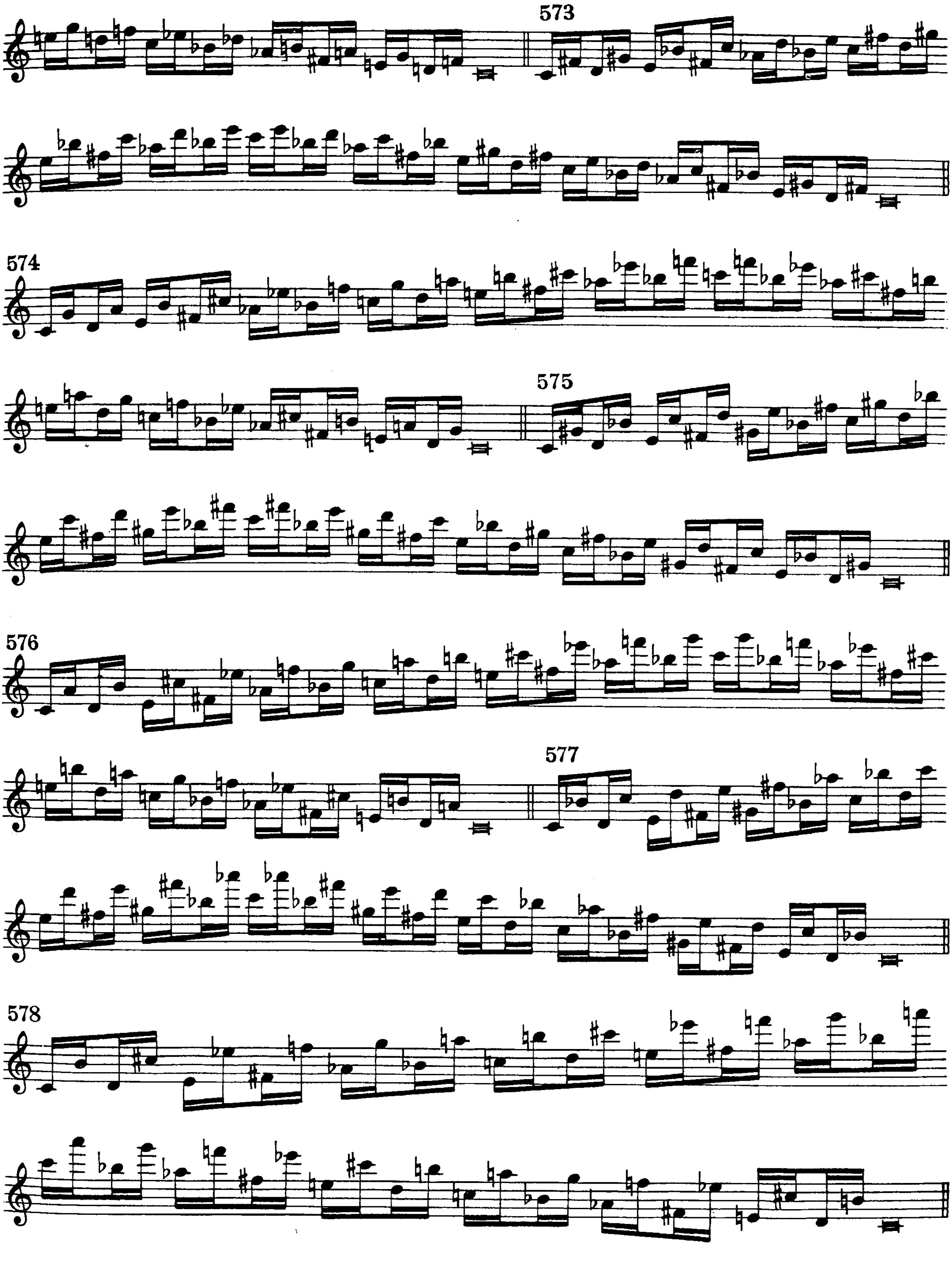




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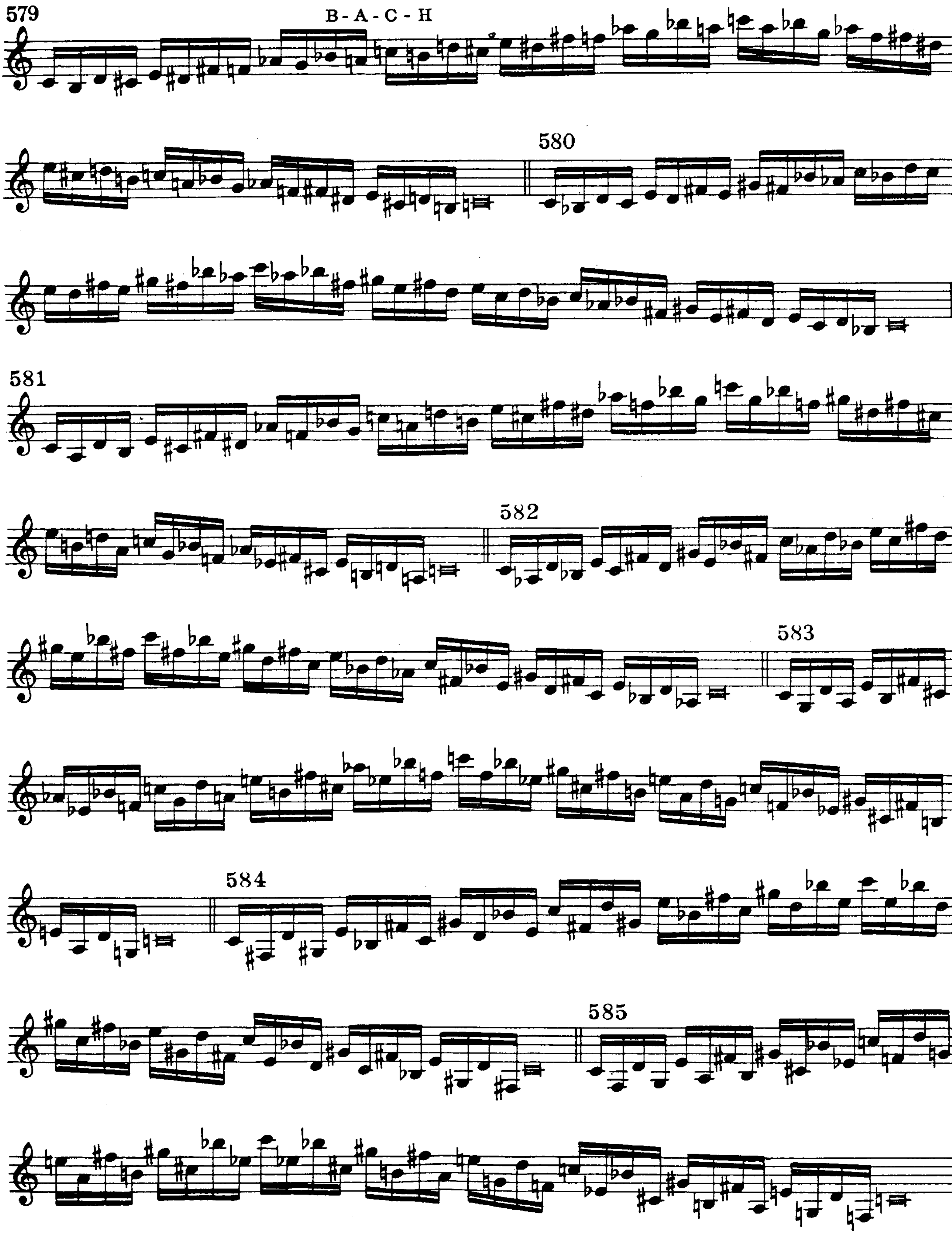




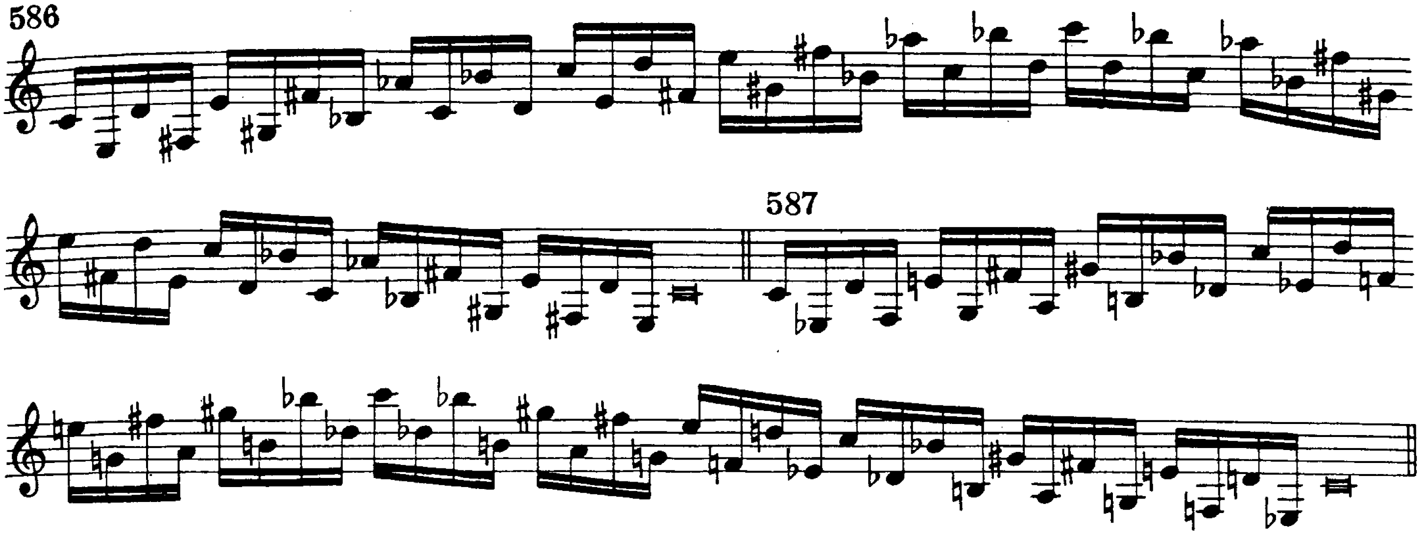
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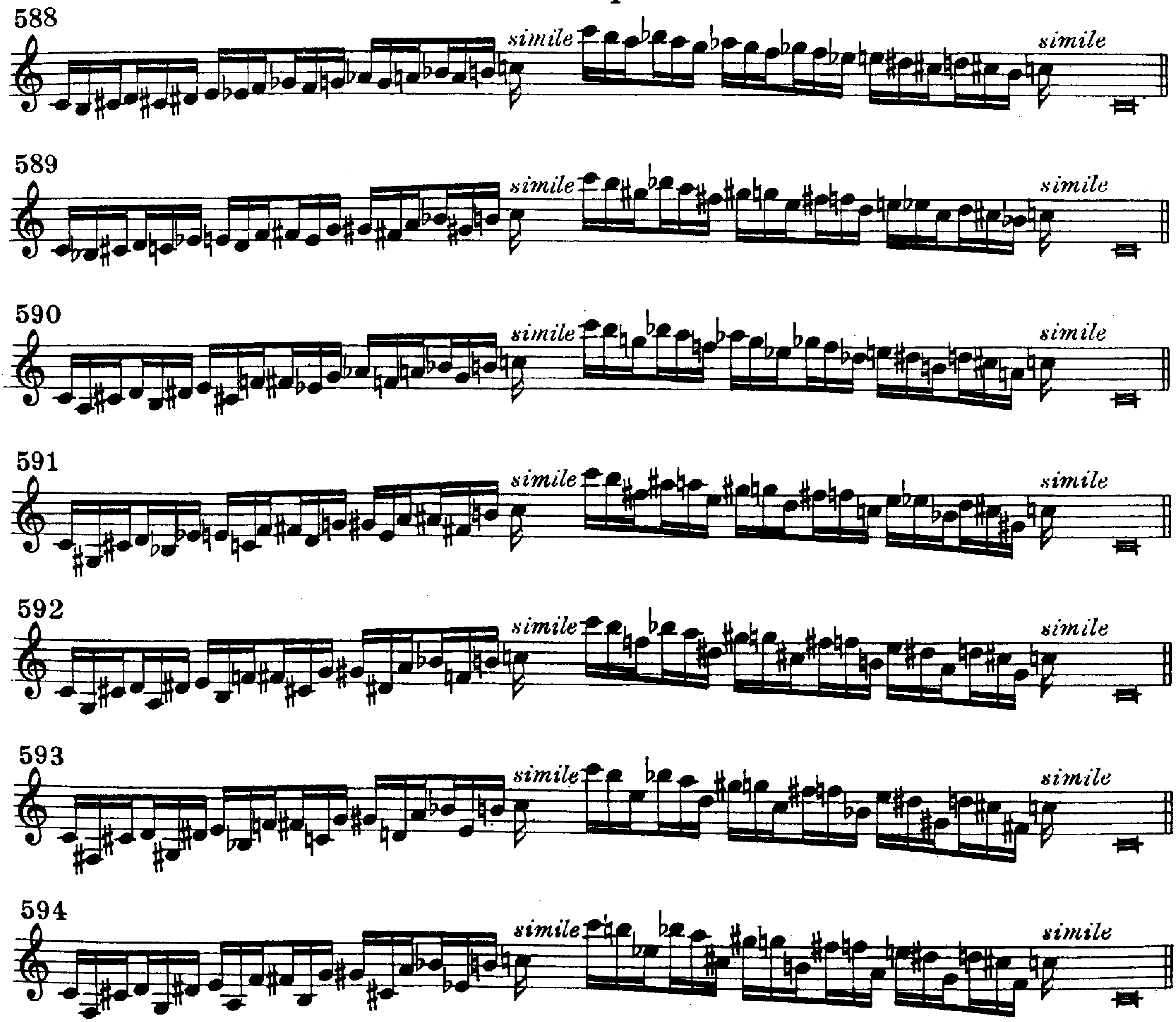



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# Infrapolation of One Note






## Infra-Interpolation



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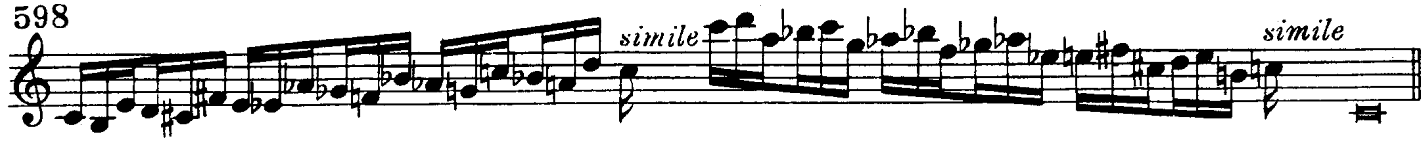



## Infra-Ultrapolation

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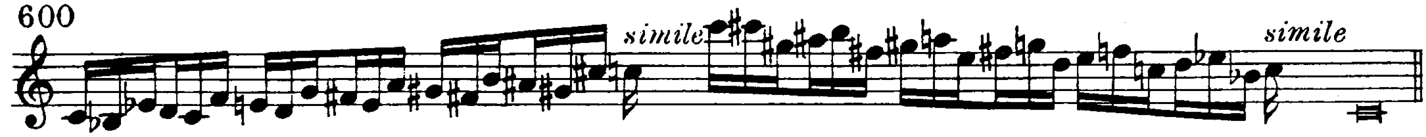



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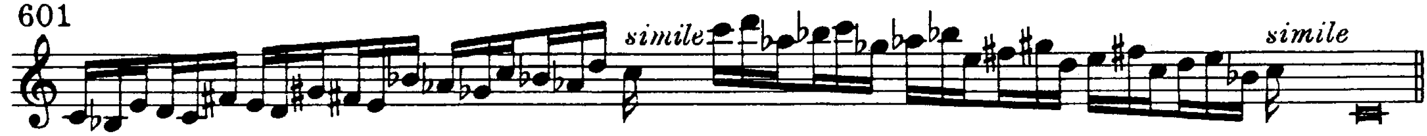



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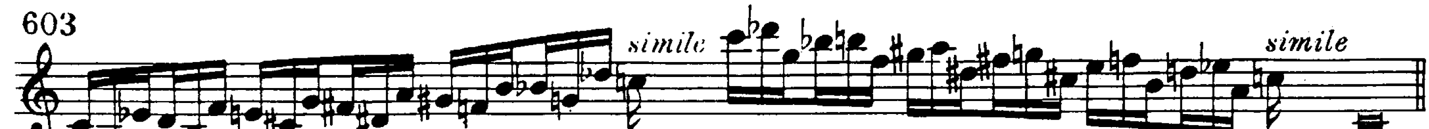



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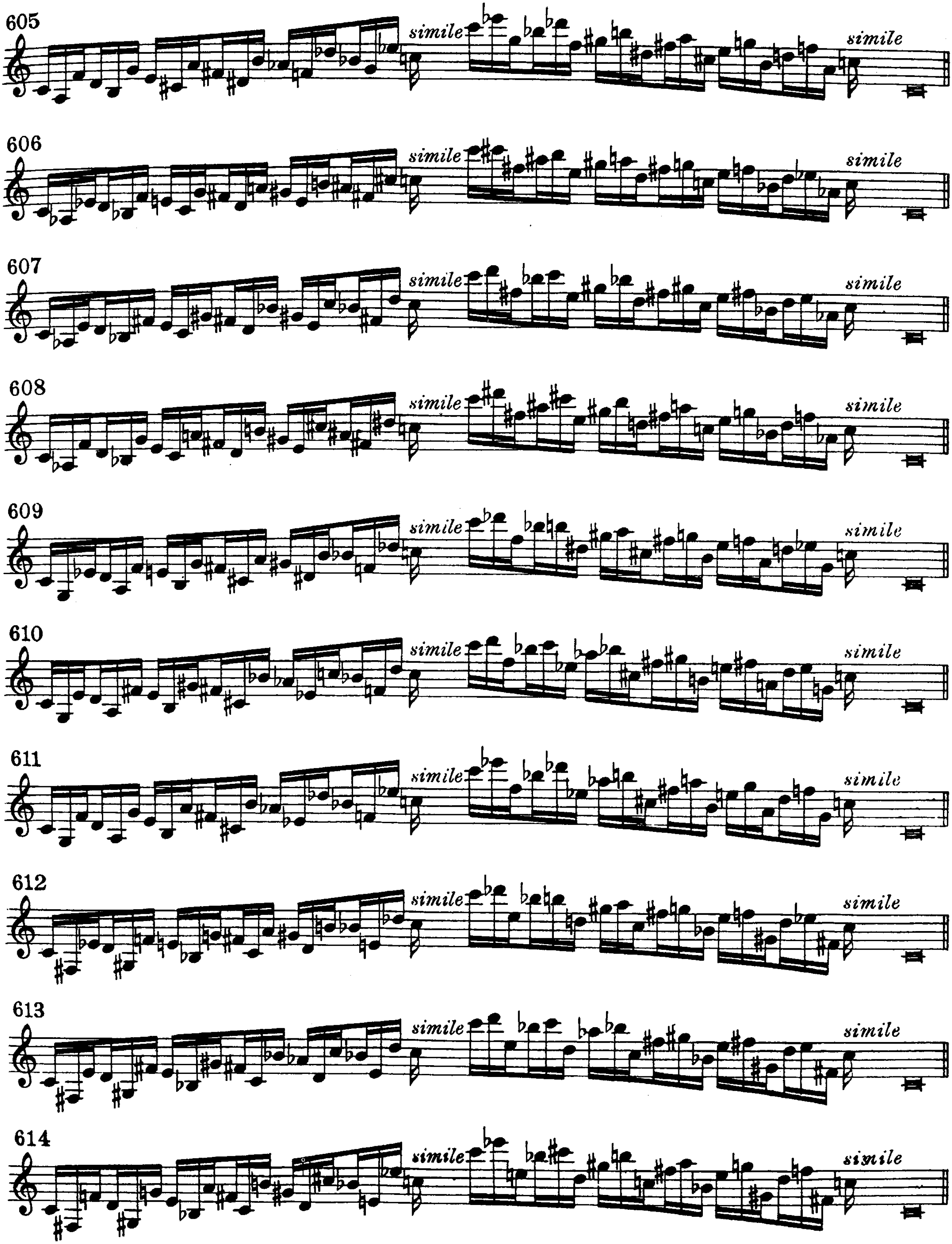



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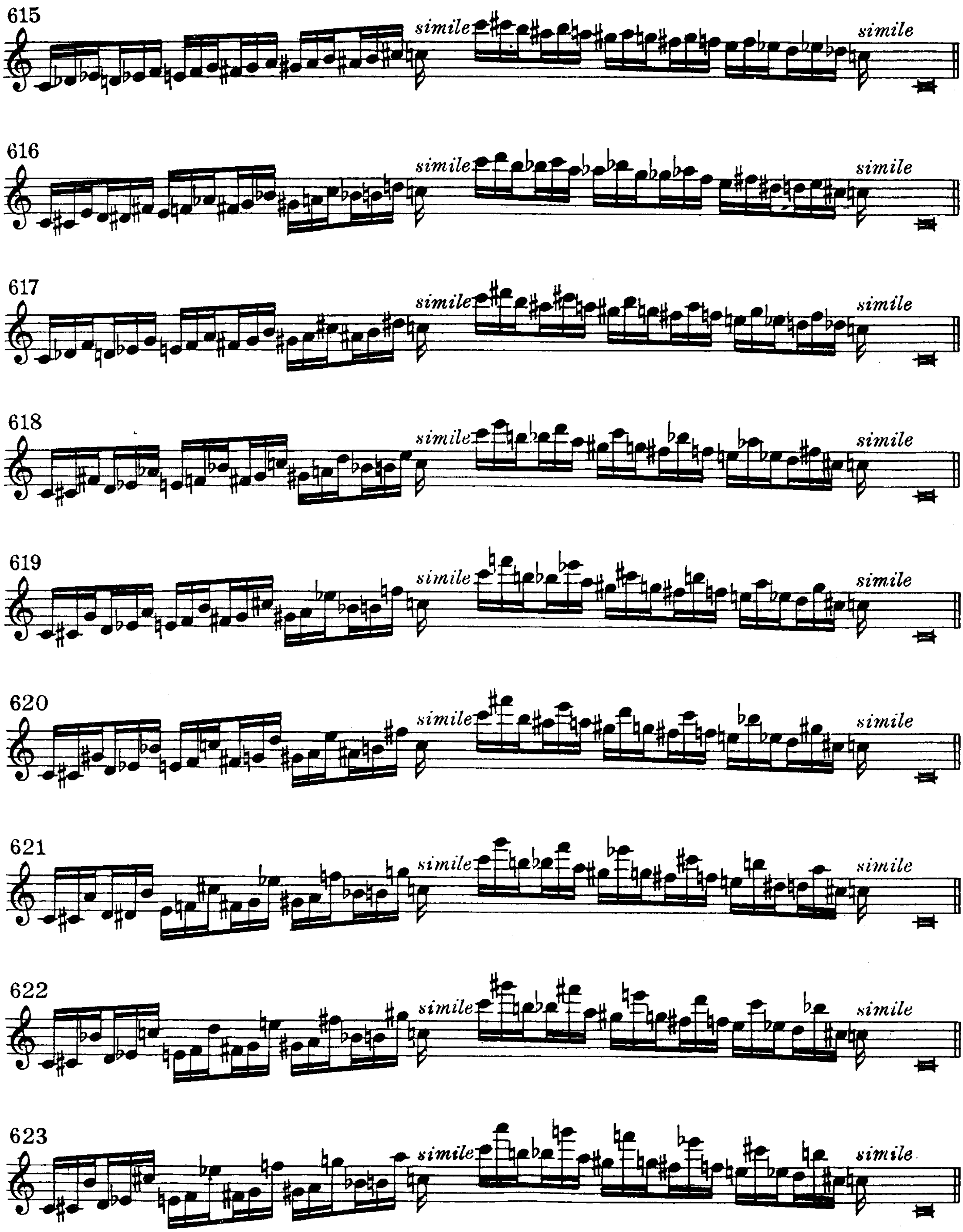



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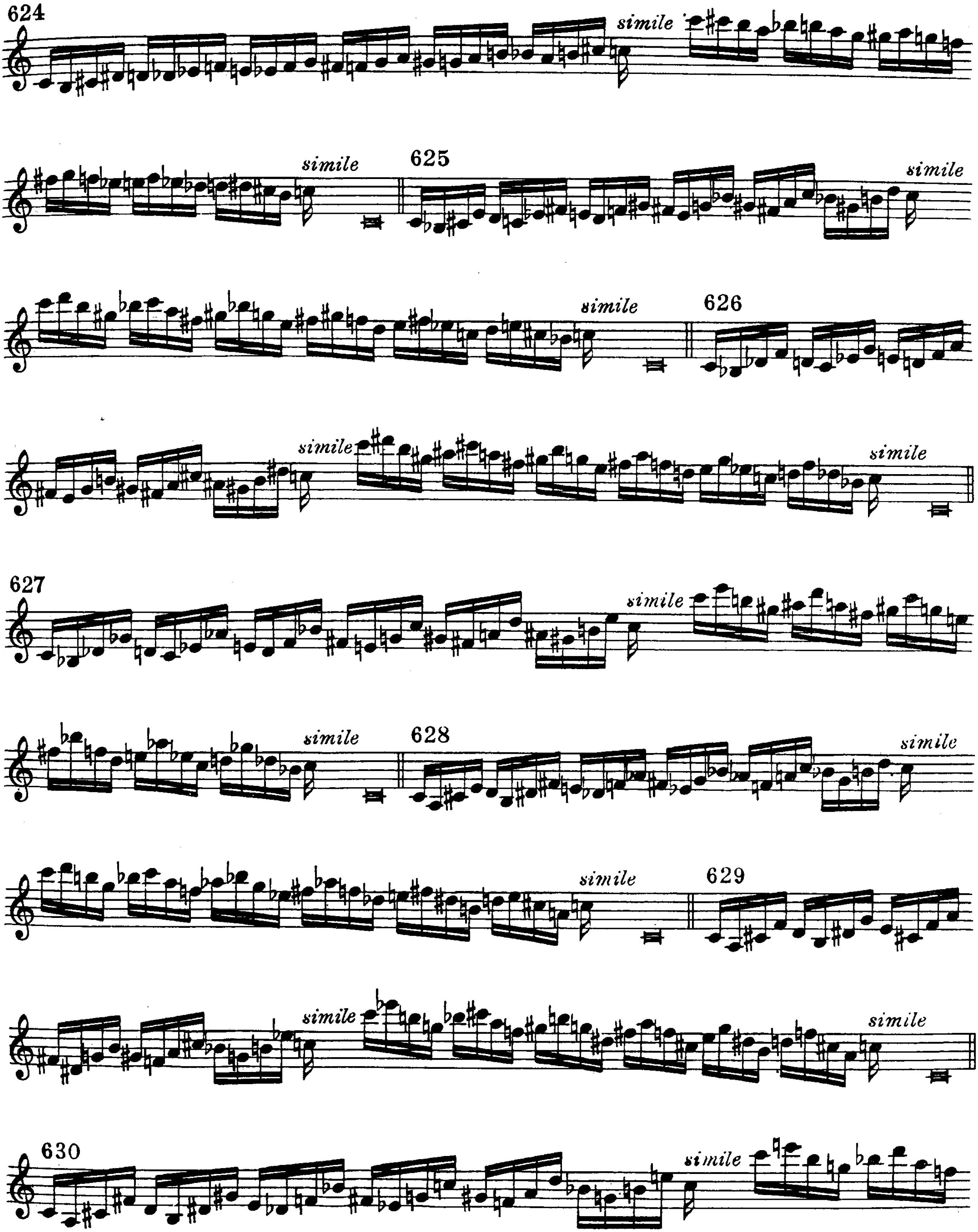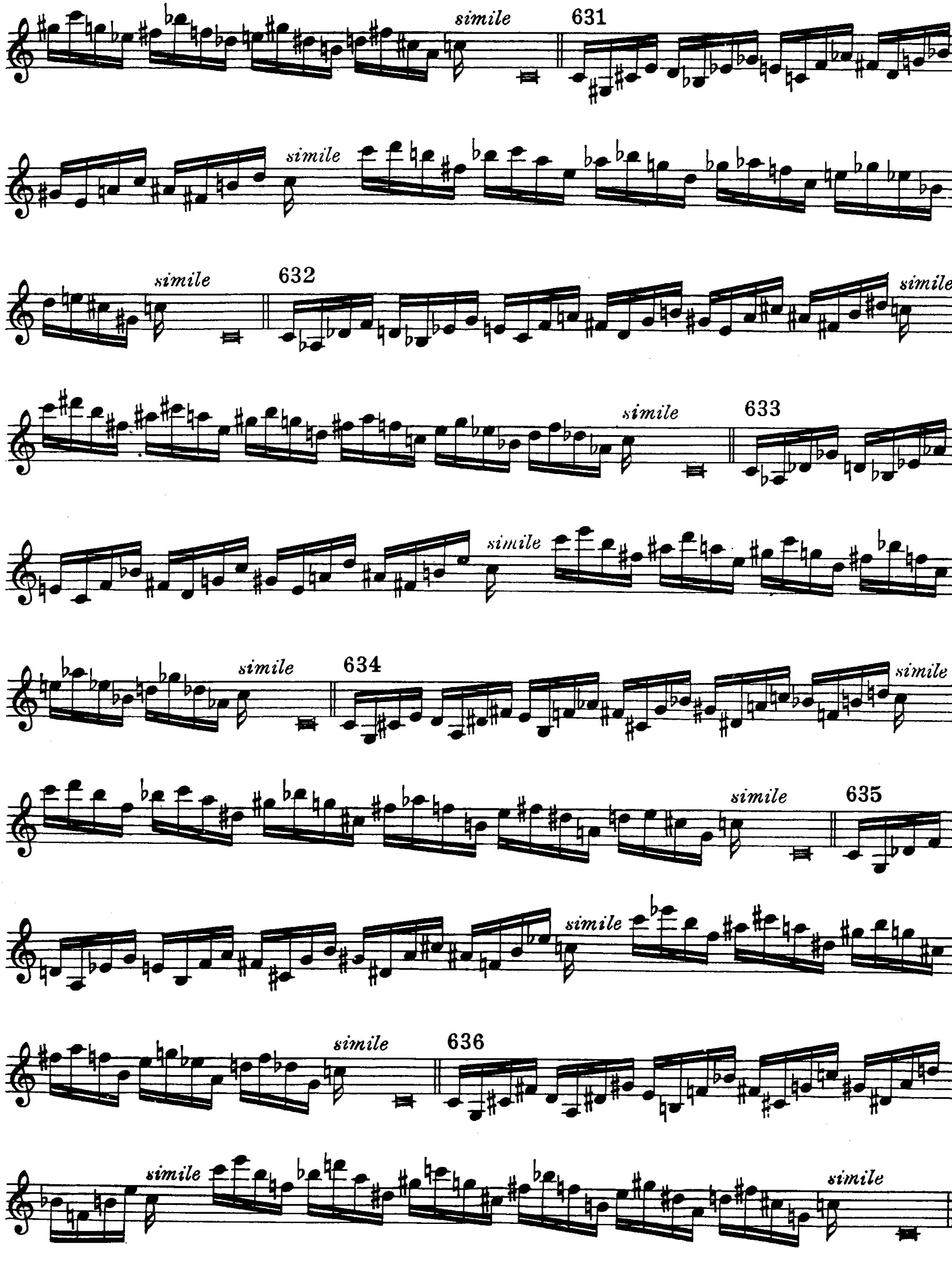



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# Inter-Ultrapolation



# Infra-Inter-Ultrapolation
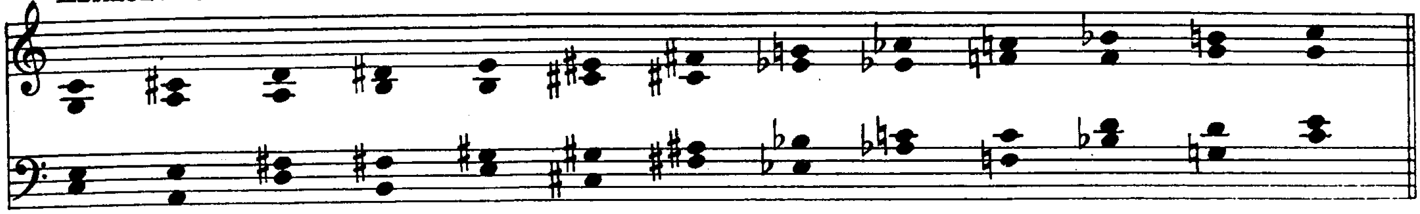



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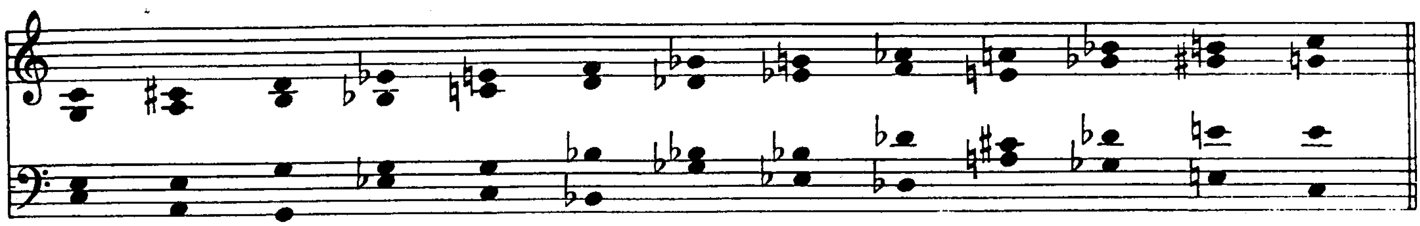
# Semitone Progression

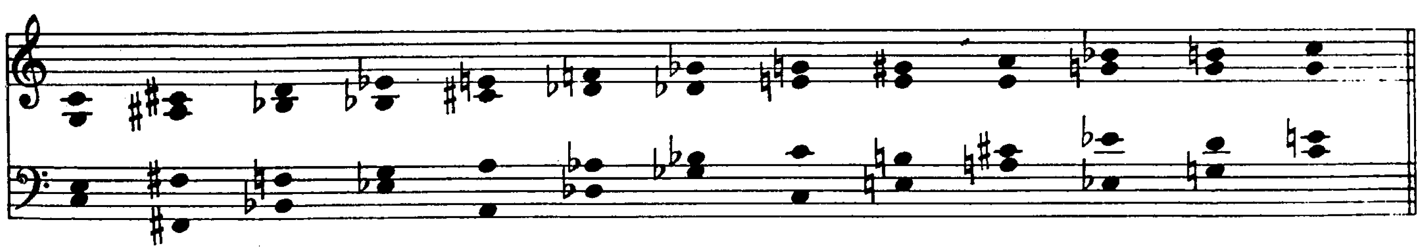
## Equal Division of One Octave into Twelve Parts



Harmonizations
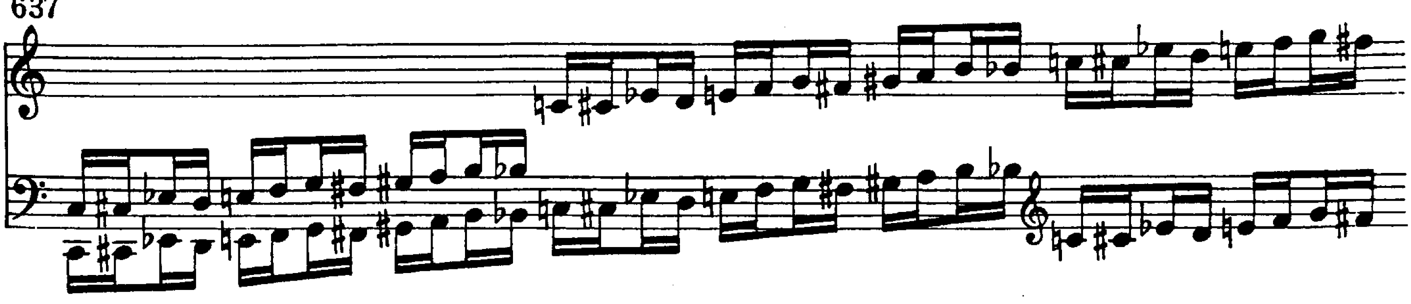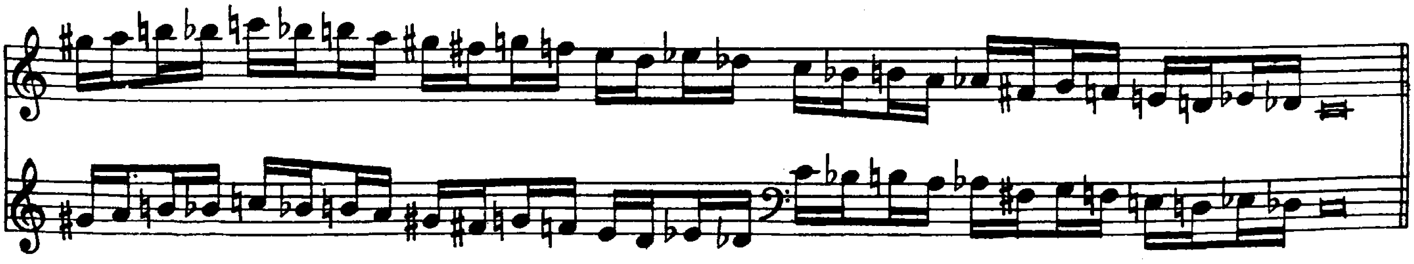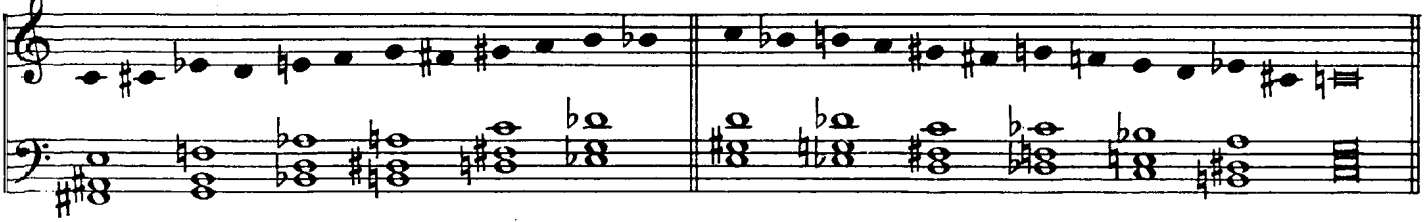






## Permutations

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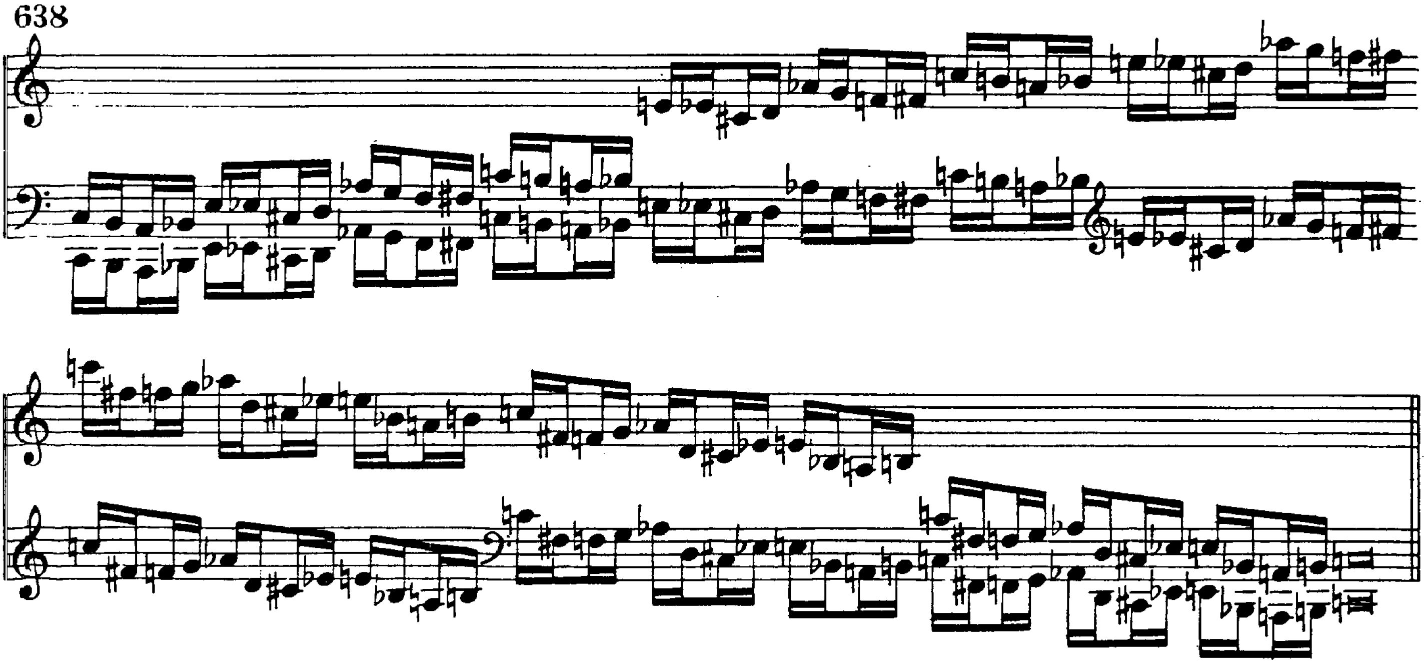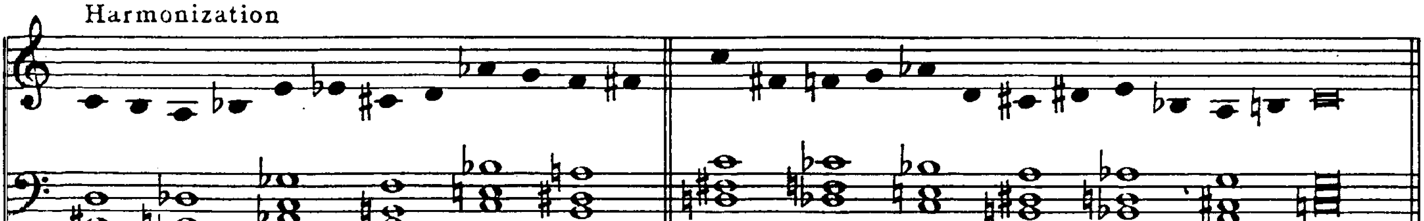




Harmonization
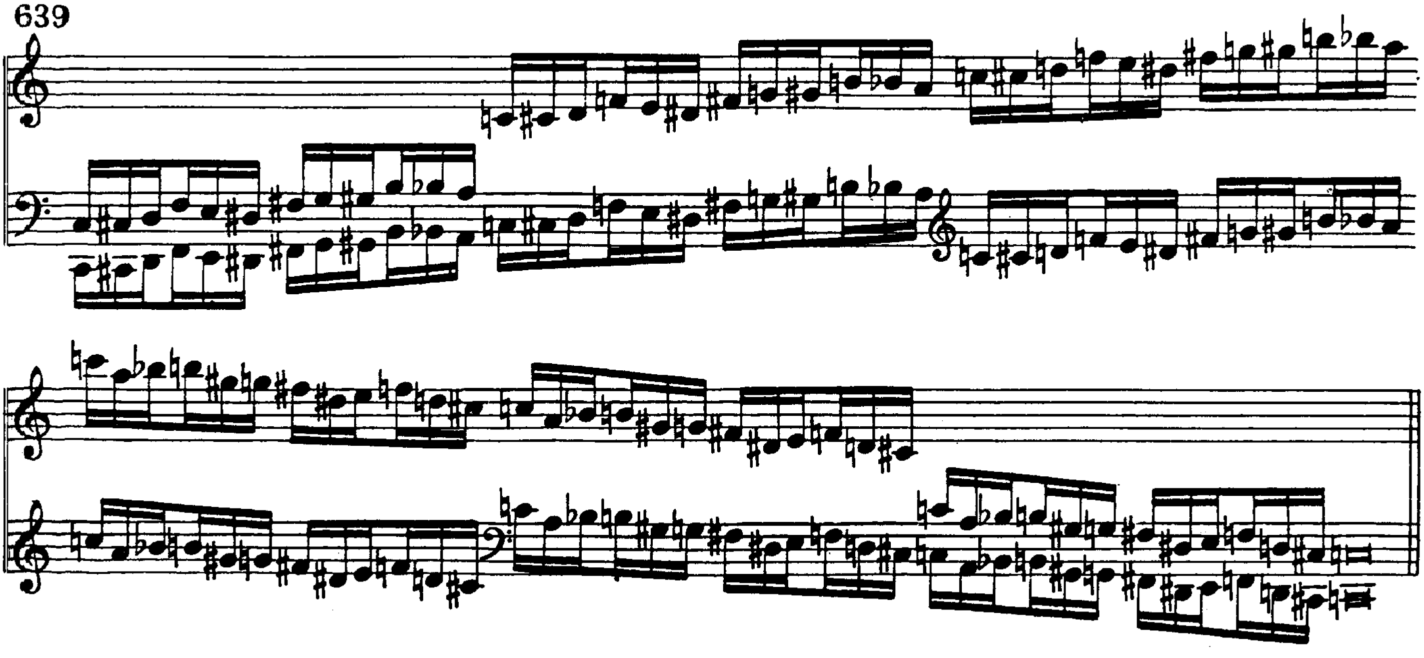


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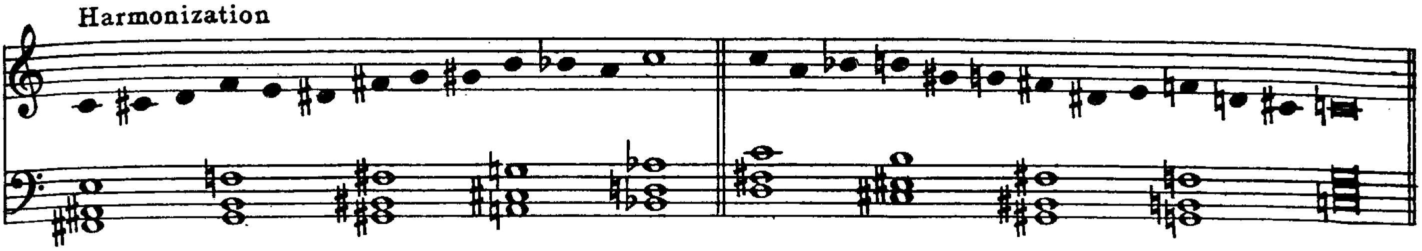


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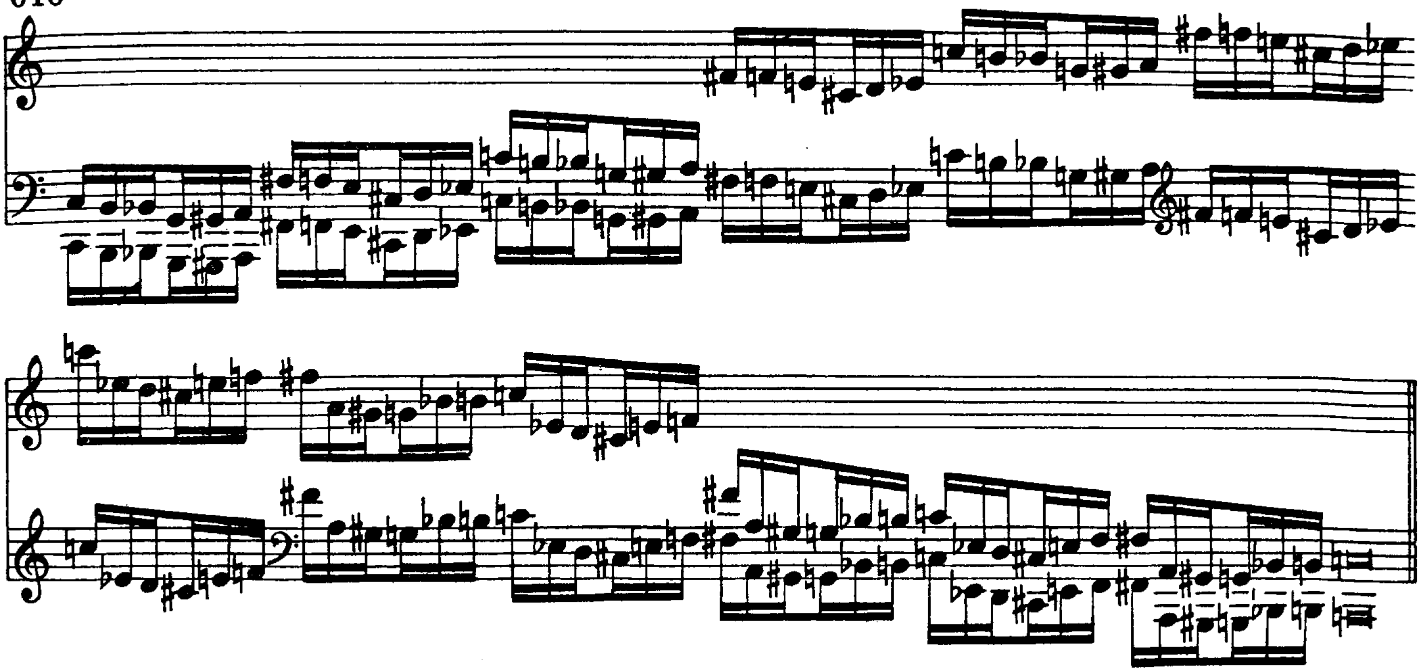


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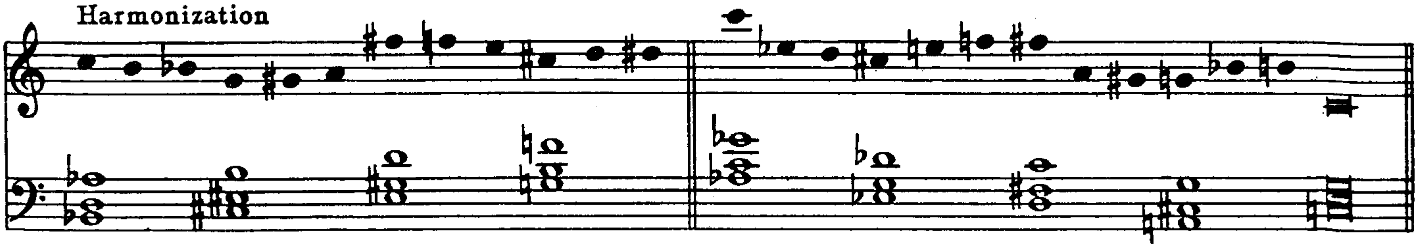


Harmonization
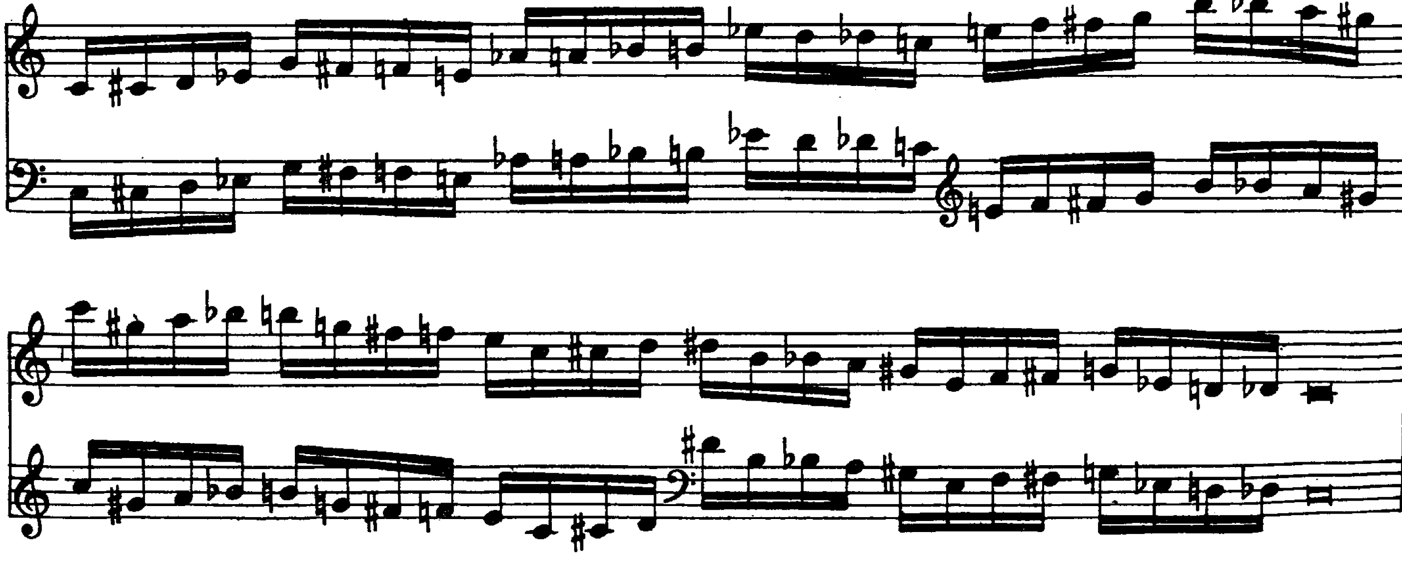


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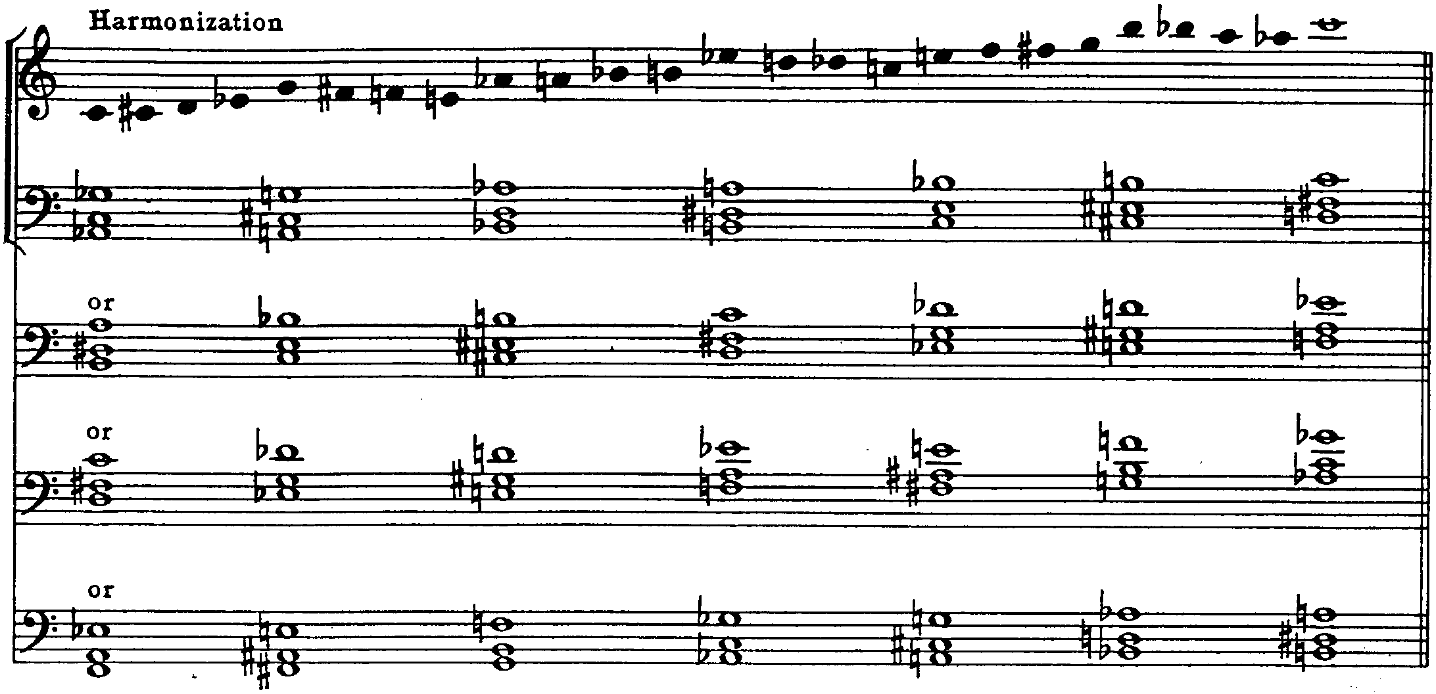


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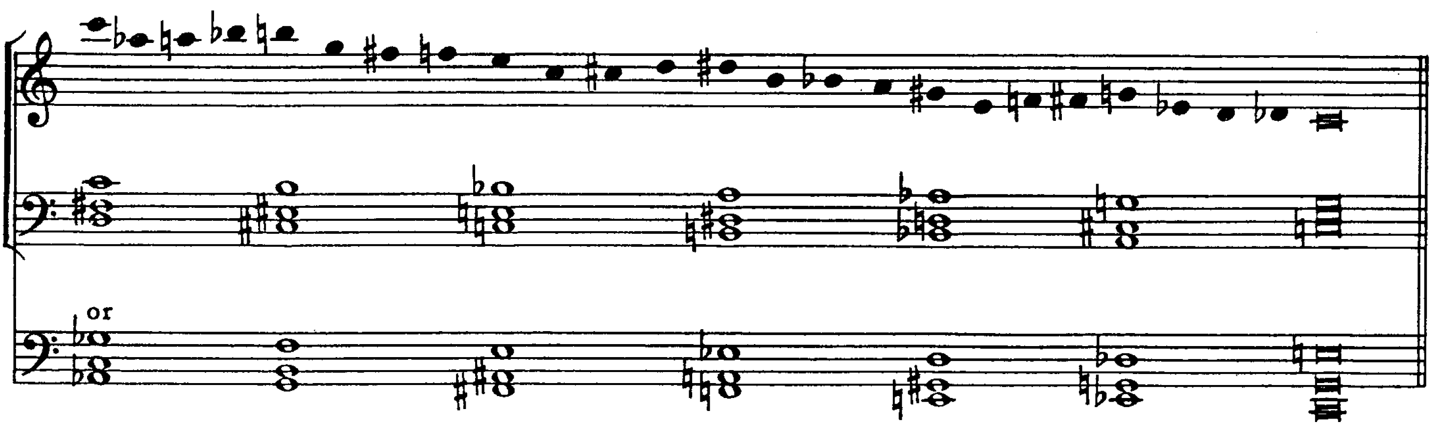


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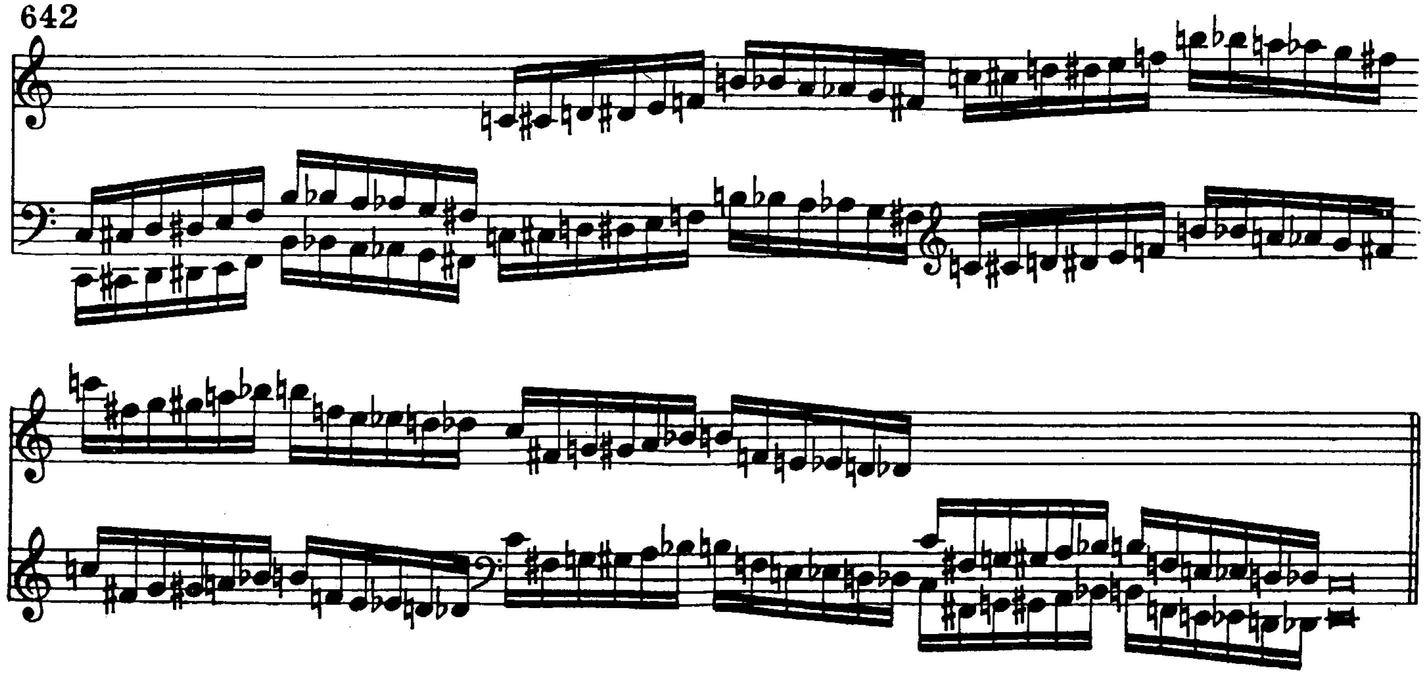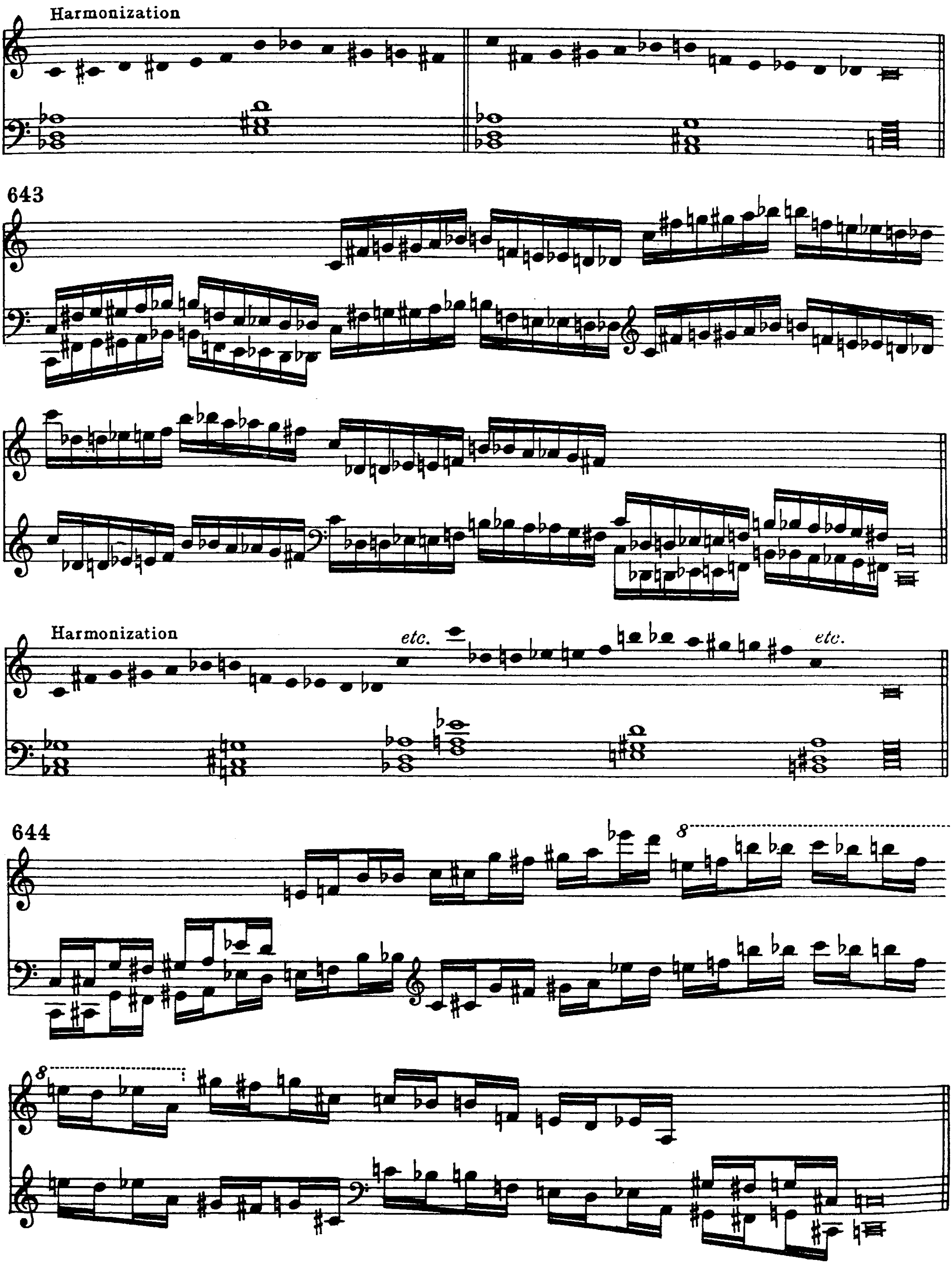


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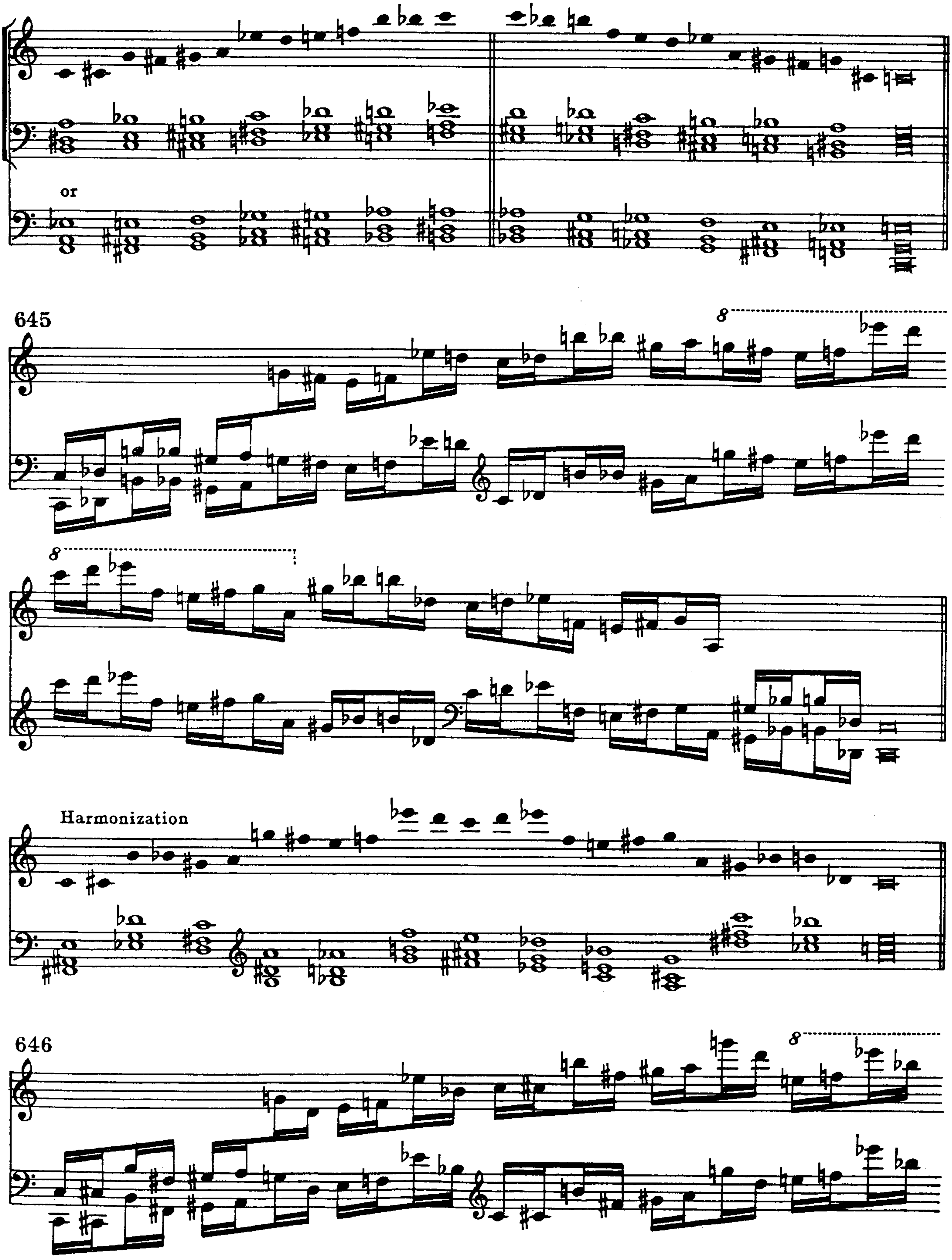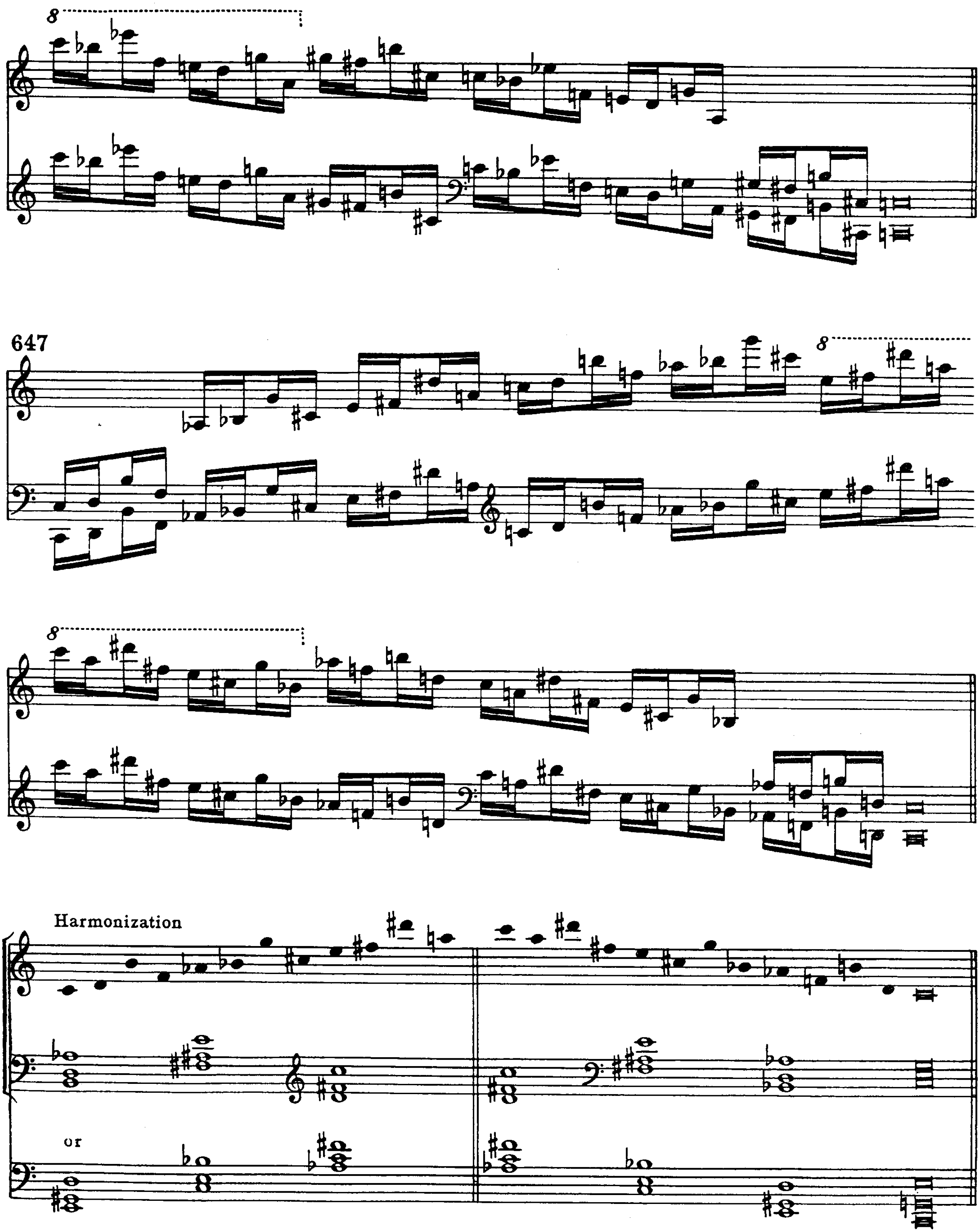






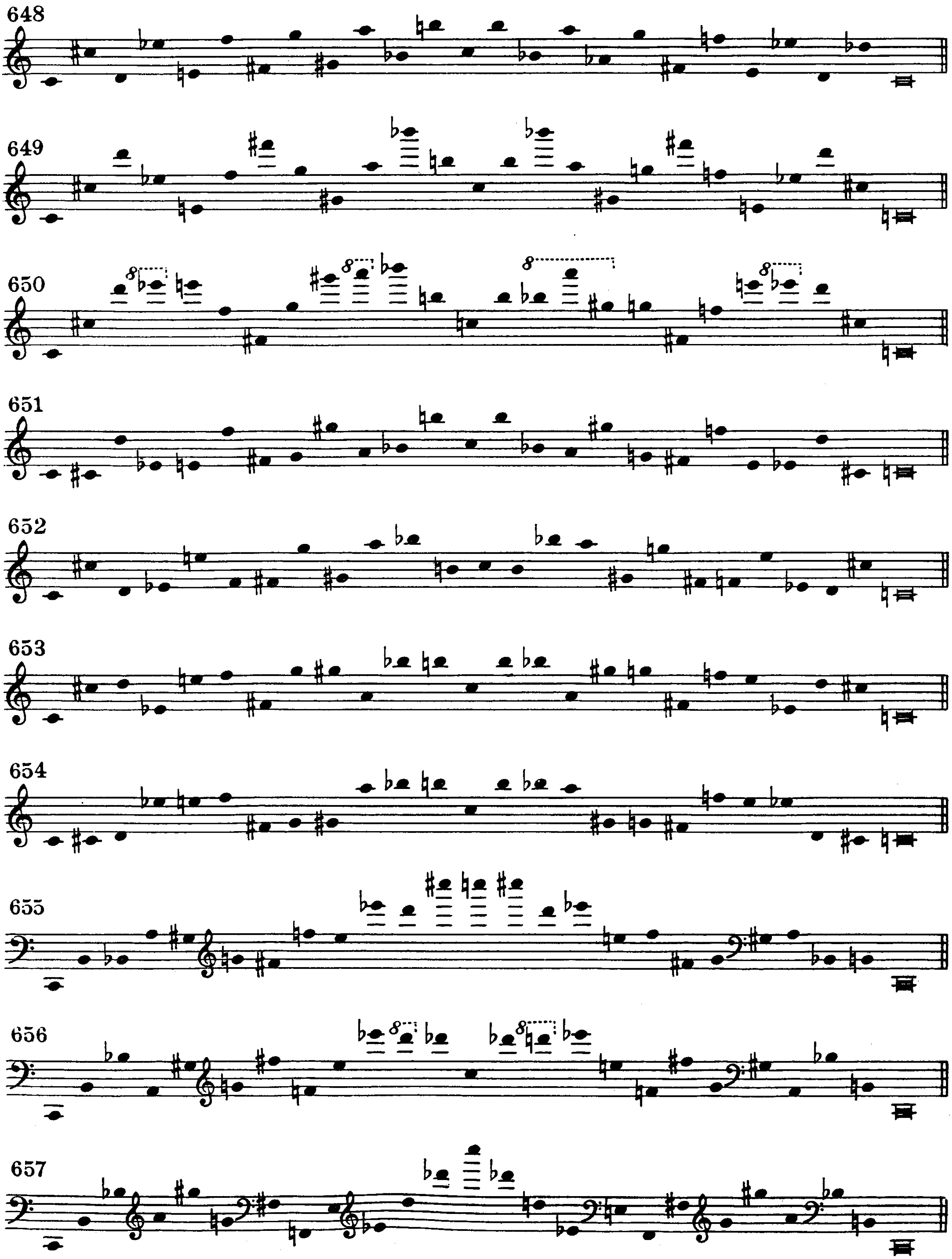
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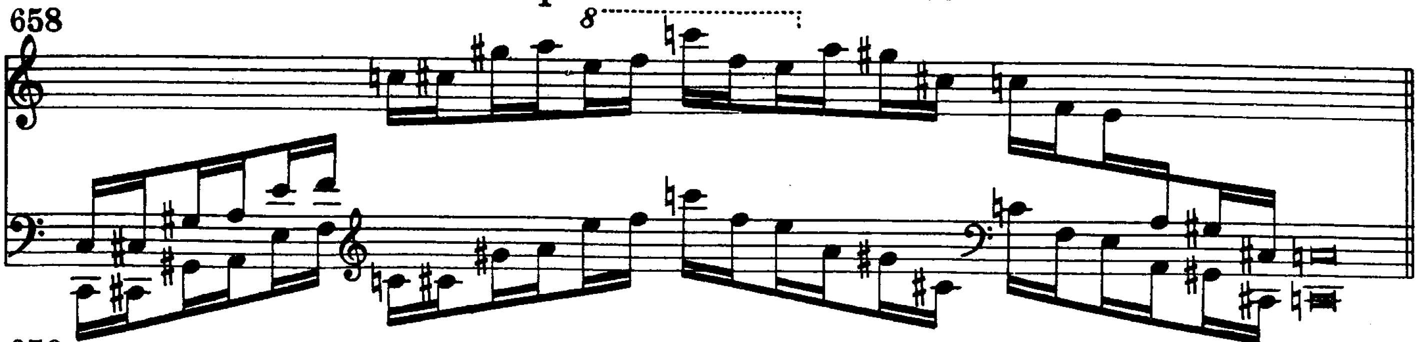
# Quadritone Progression

## Equal Division of Two Octaves into Three Parts

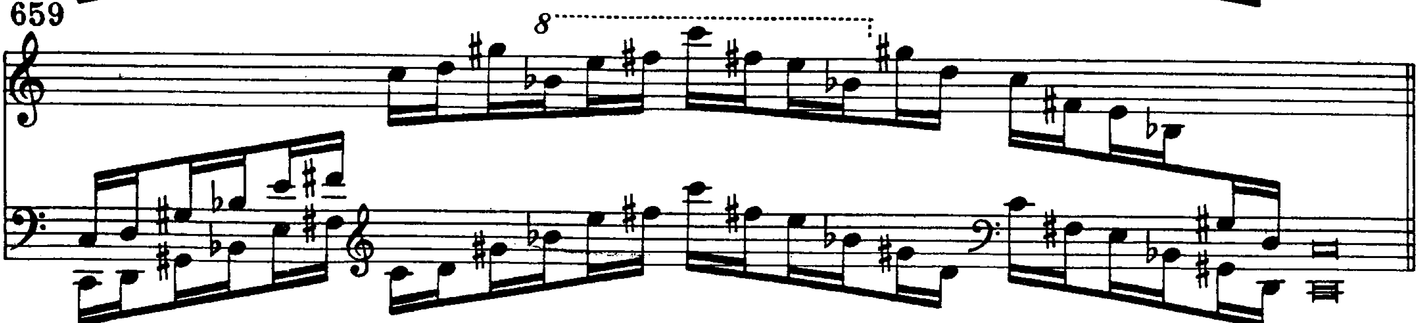


### Interpolation of One Note
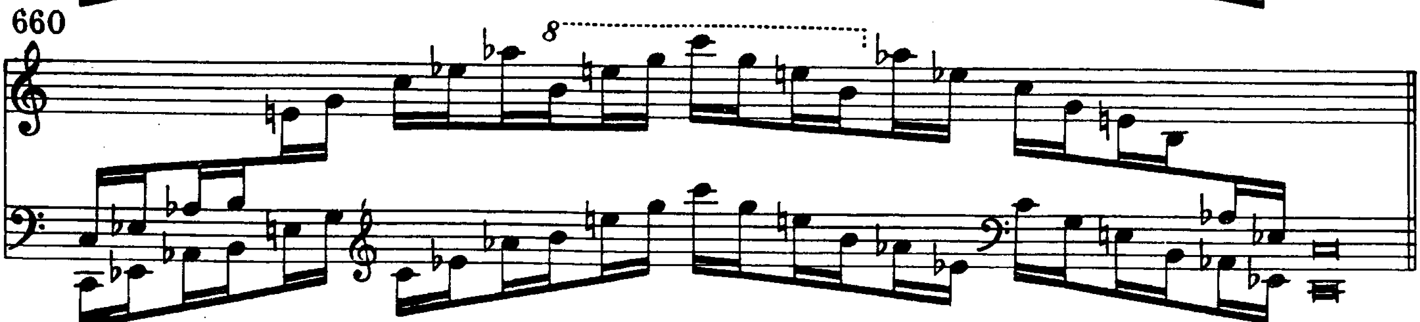
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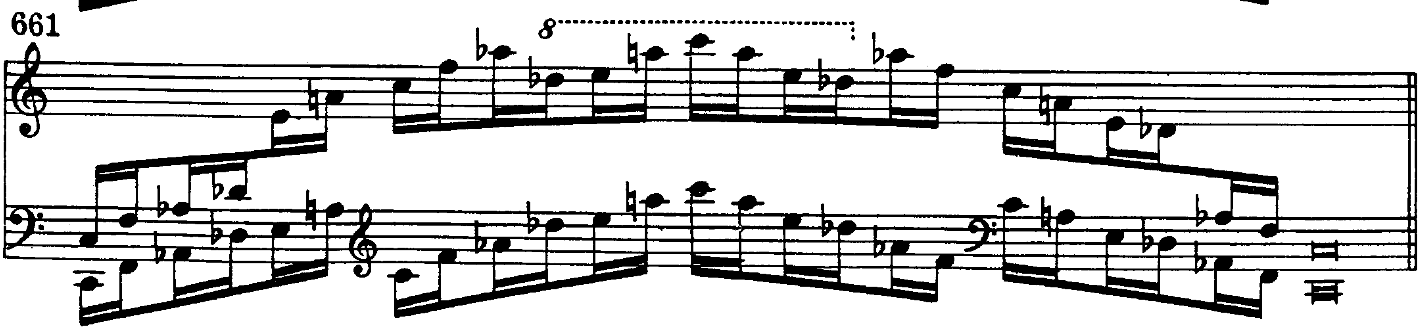
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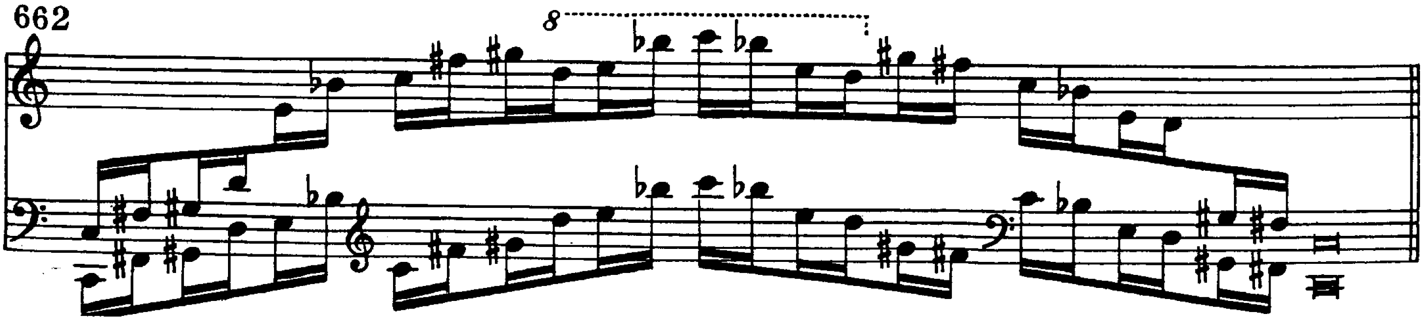


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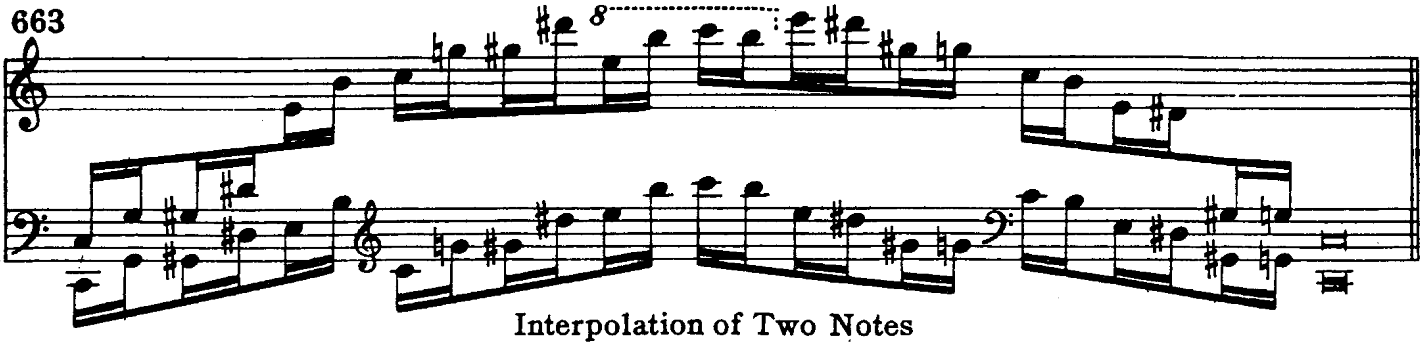


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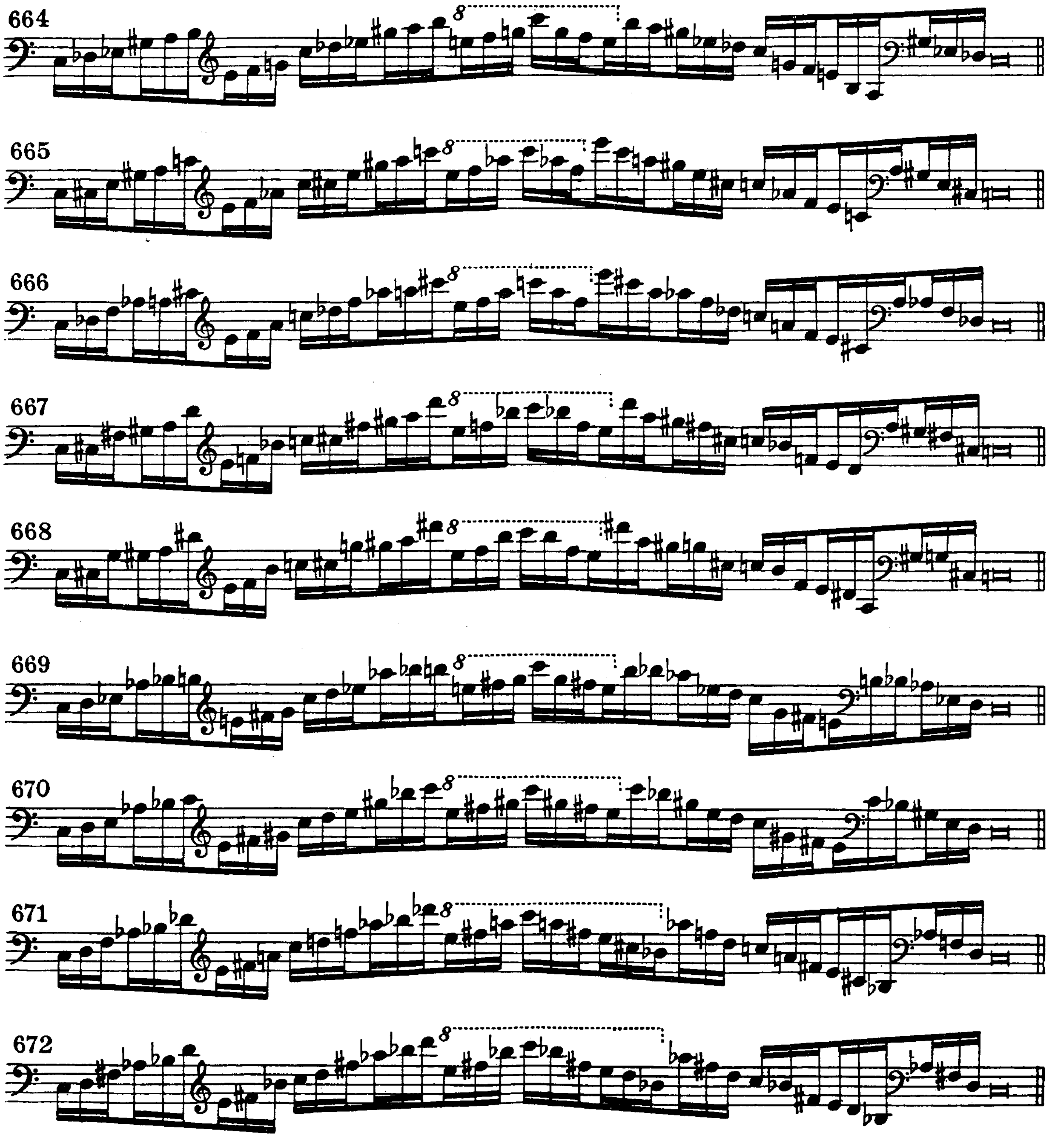


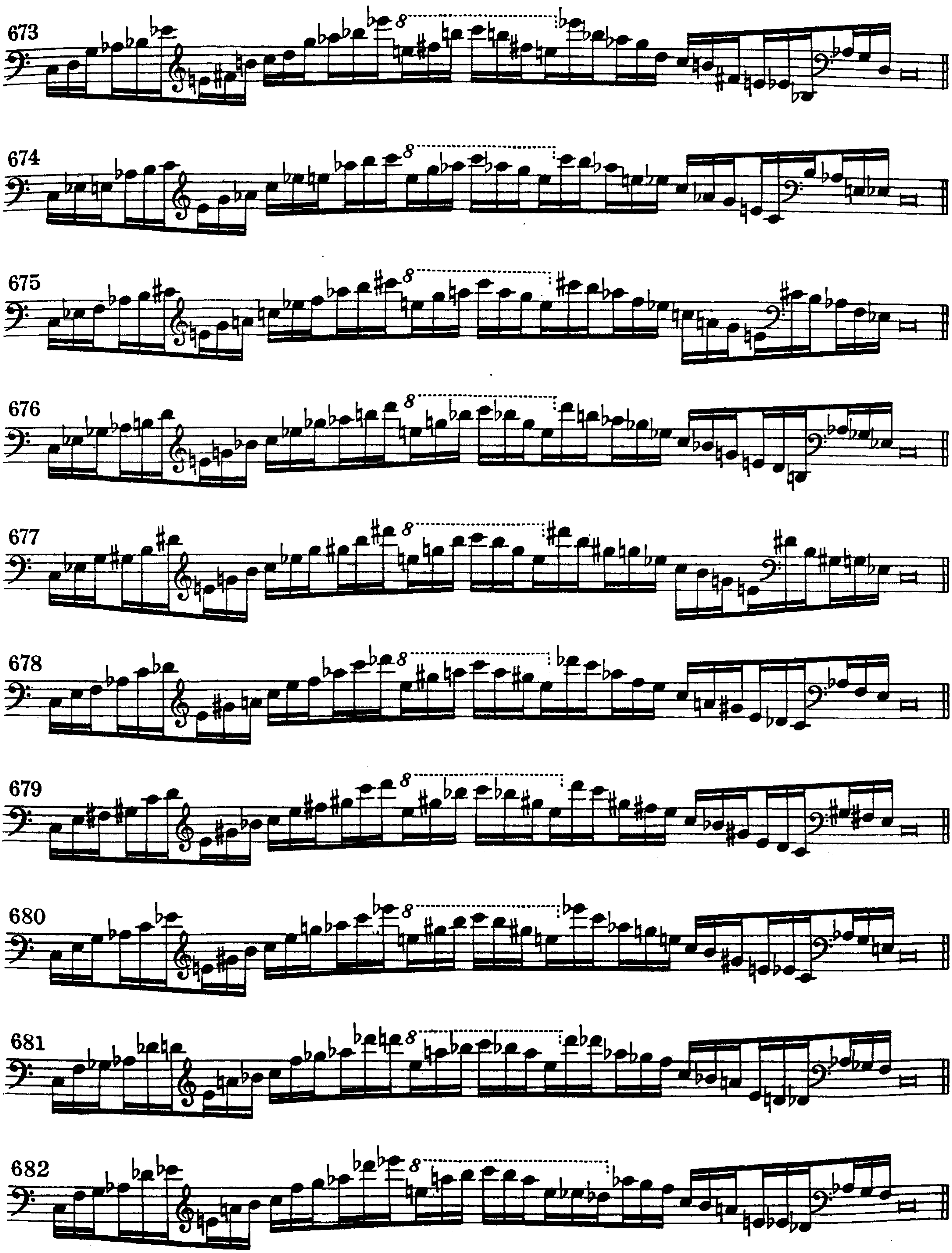
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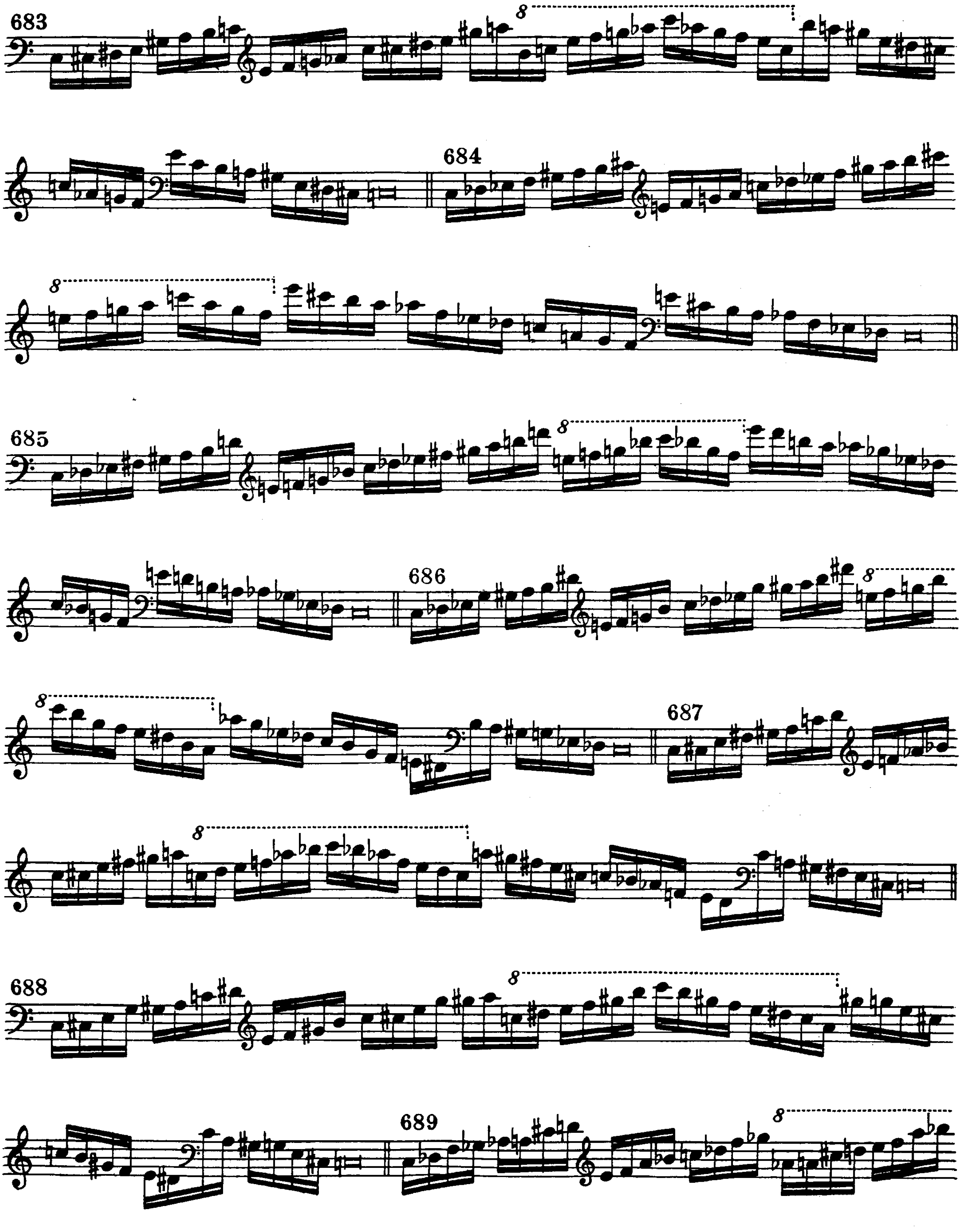




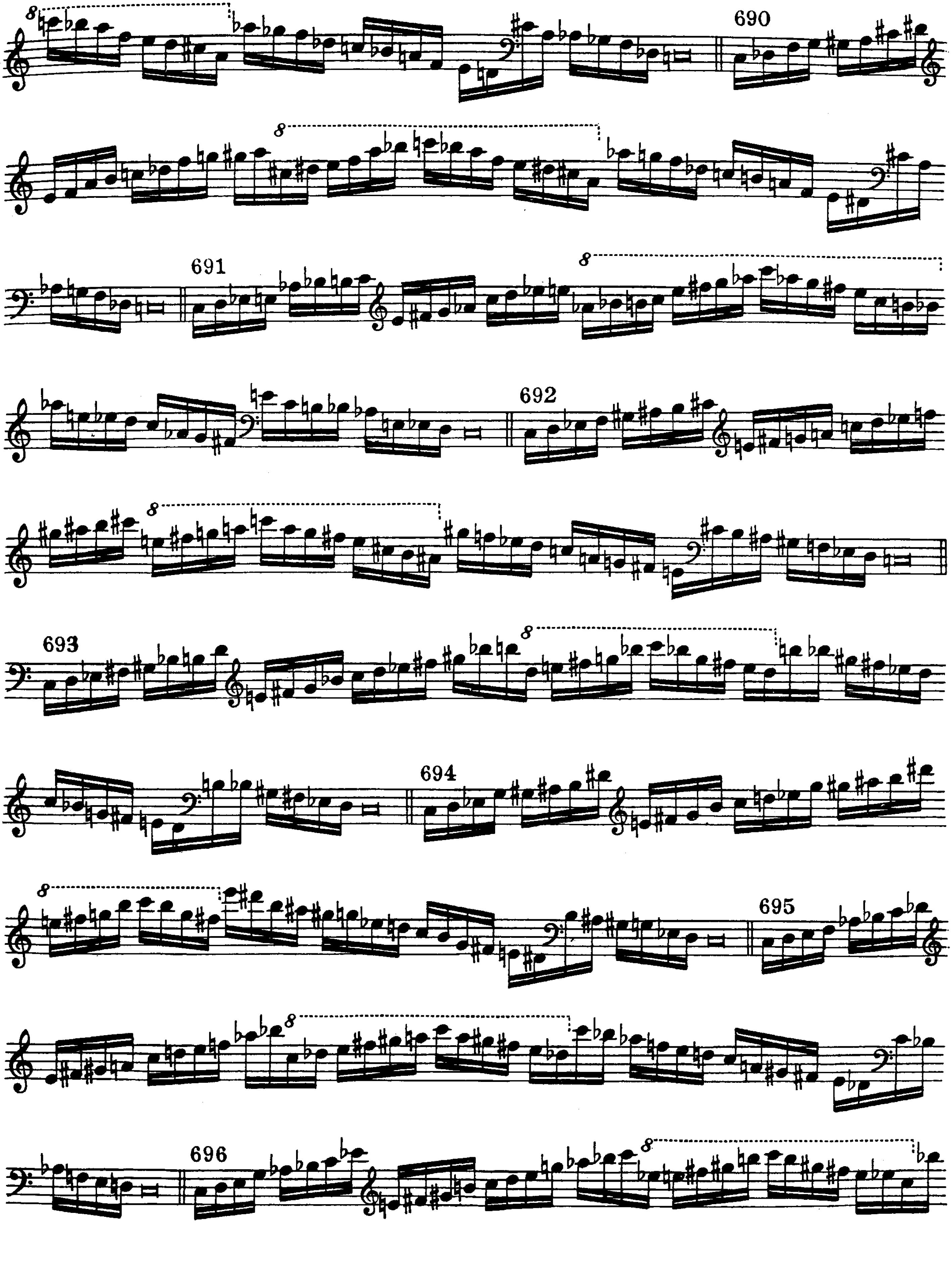

Interpolation of Two Notes

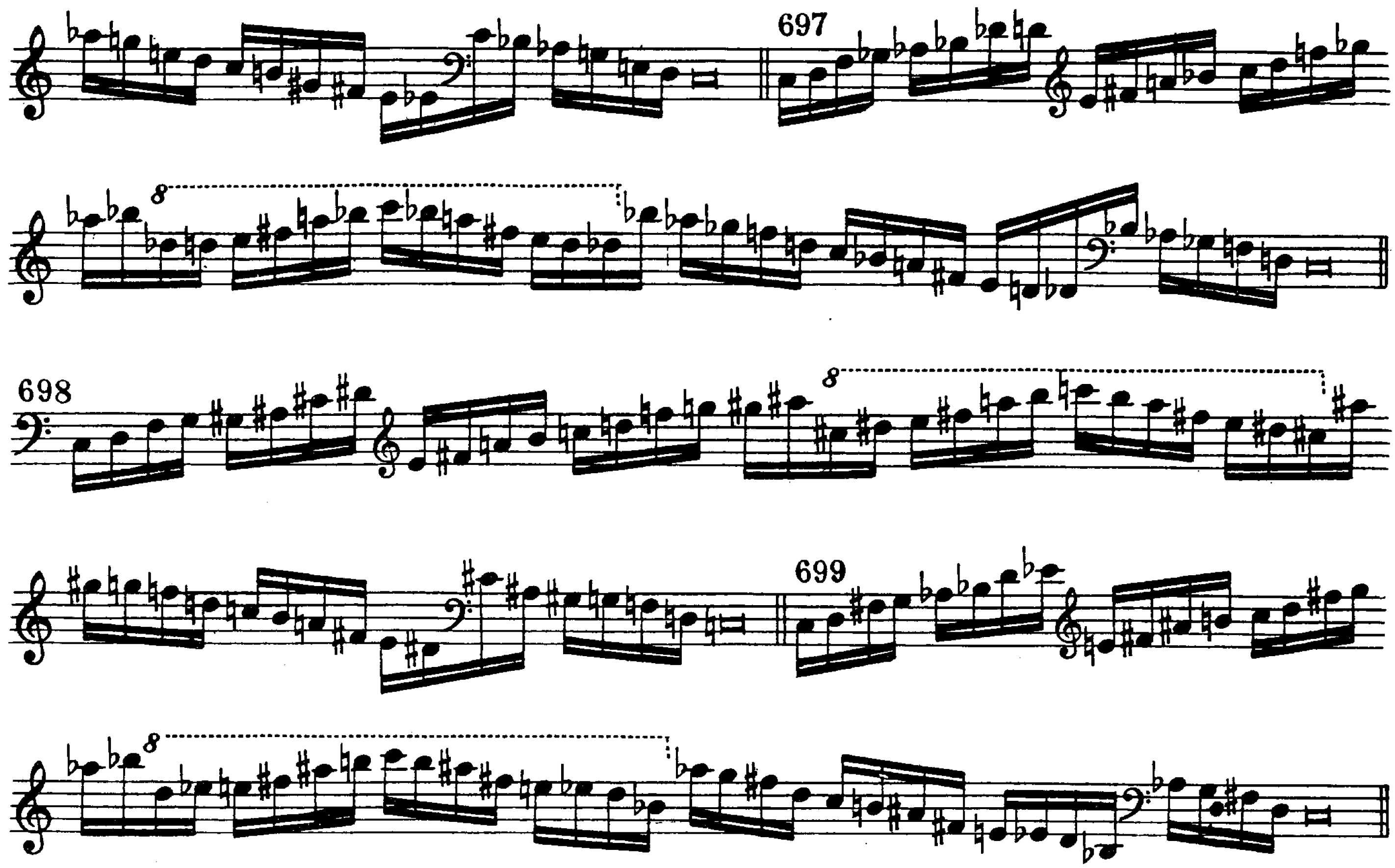



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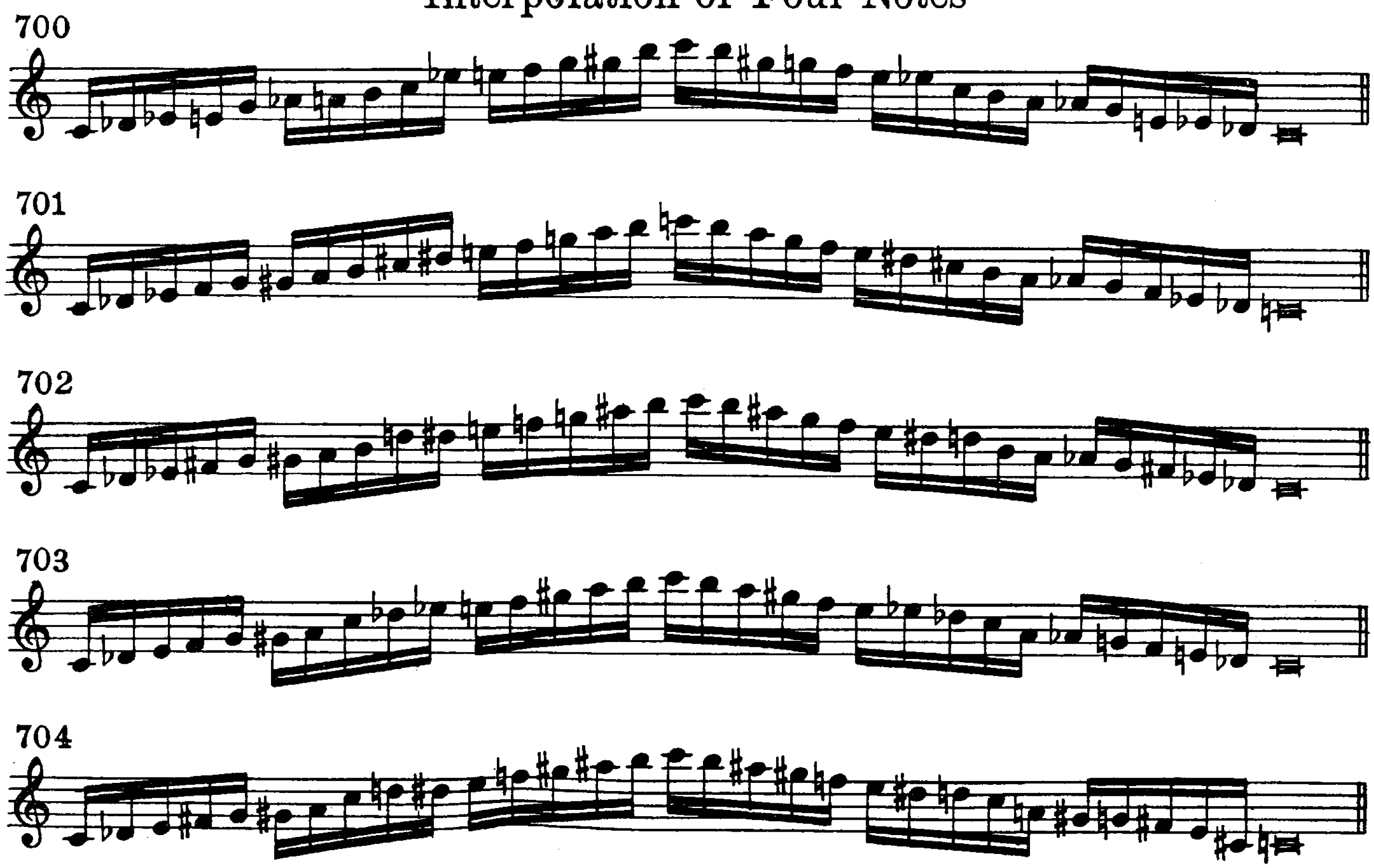
# Interpolation of Three Notes
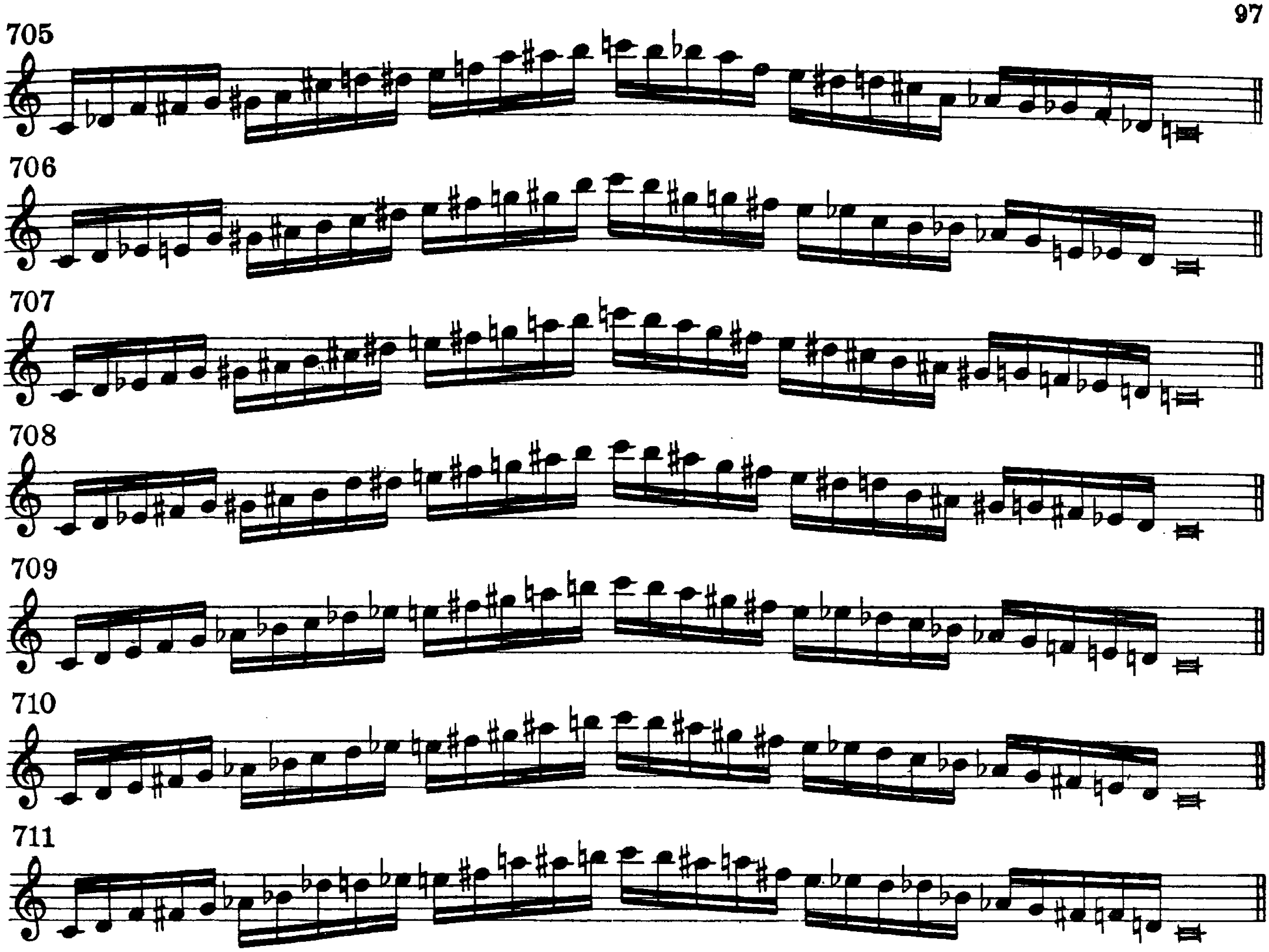



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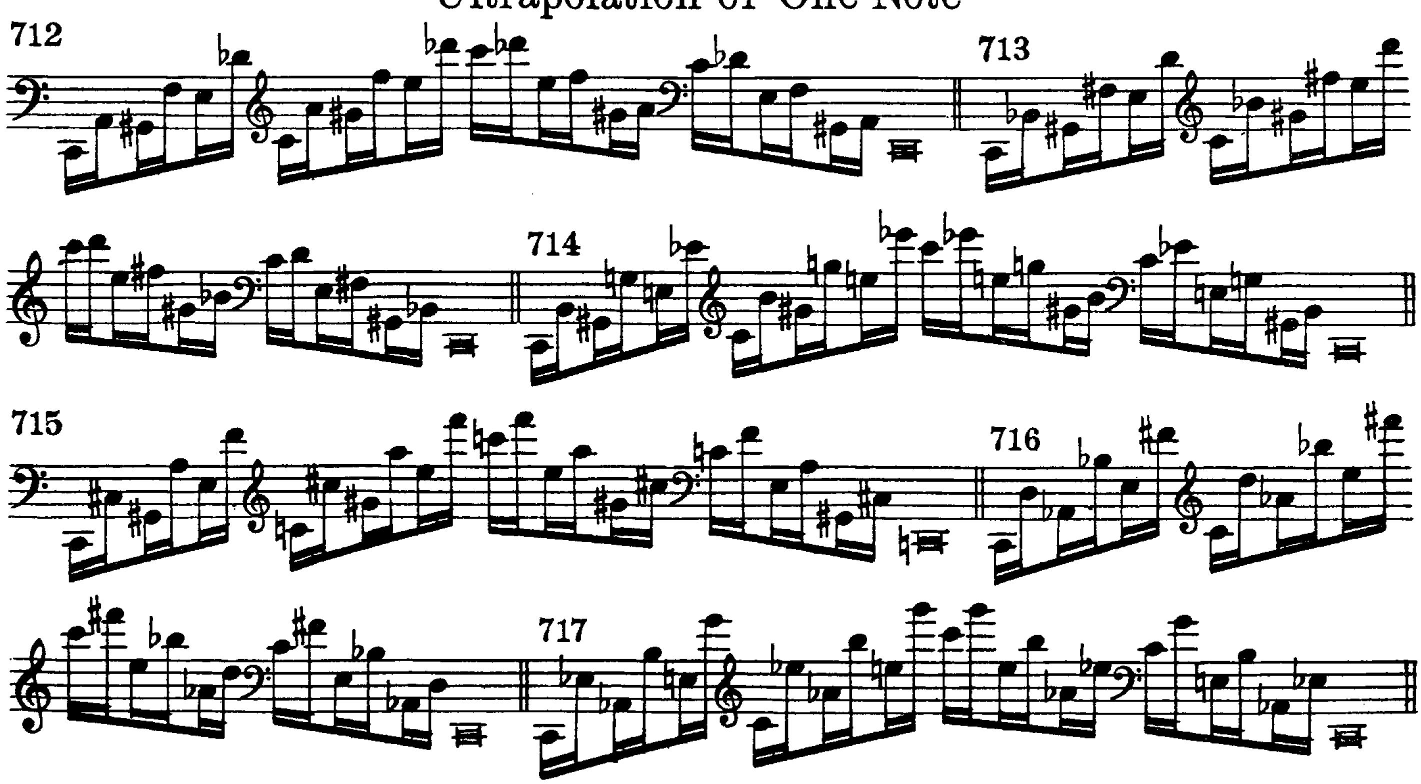



## Interpolation of Four Notes



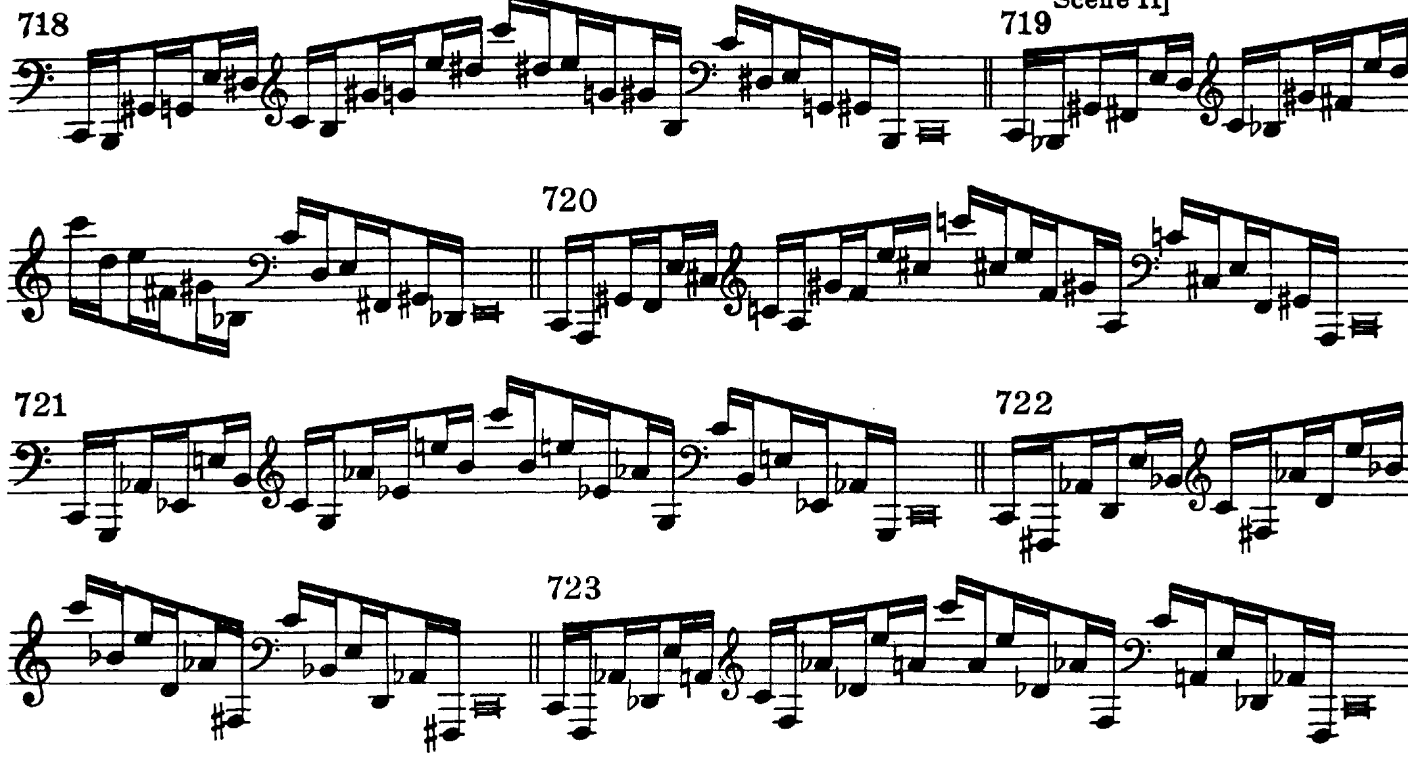



## Ultrapolation of One Note
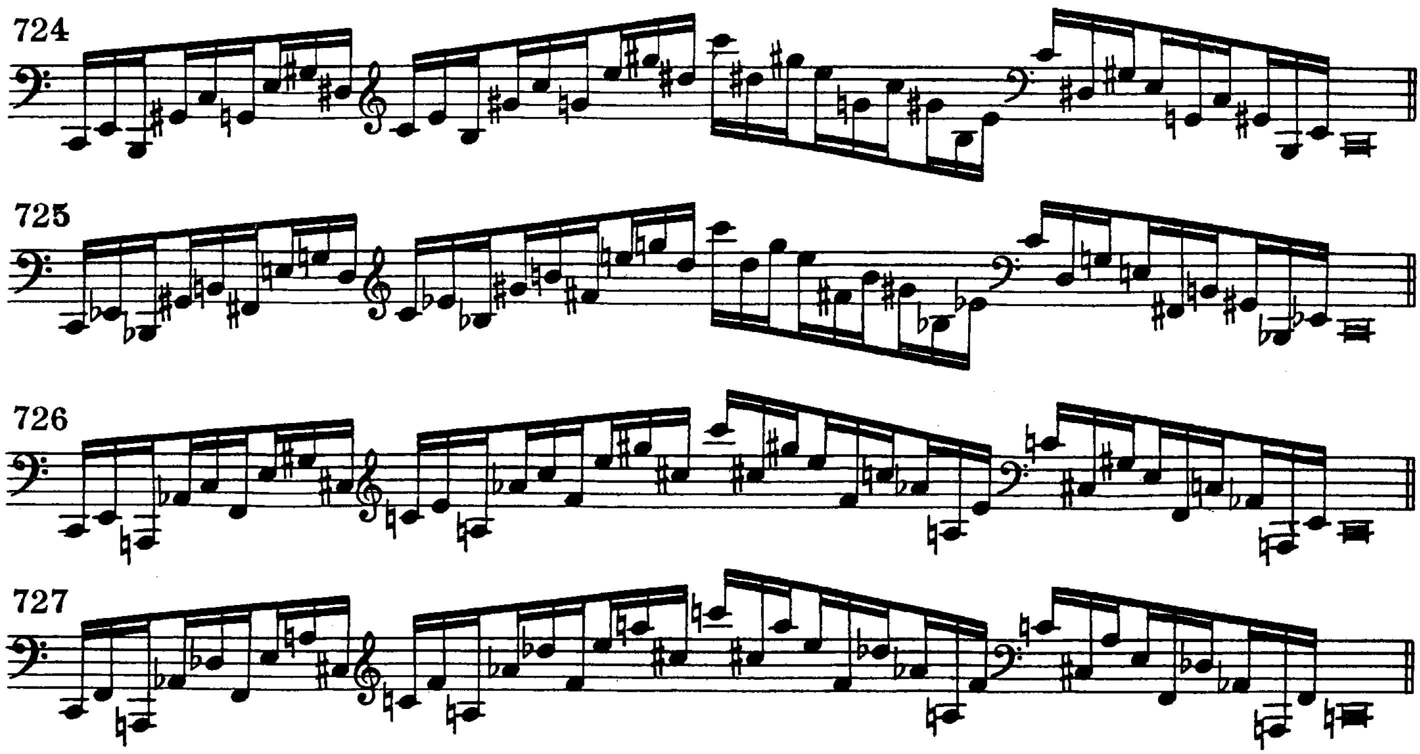


## Infrapolation of One Note
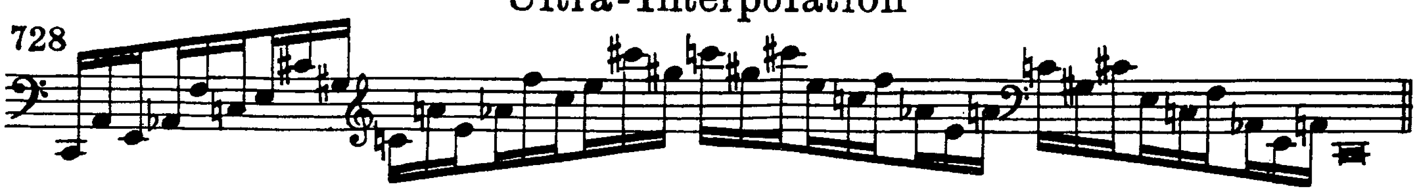
[Rimsky-Korsakov: *Coq d'or*, Scene II]

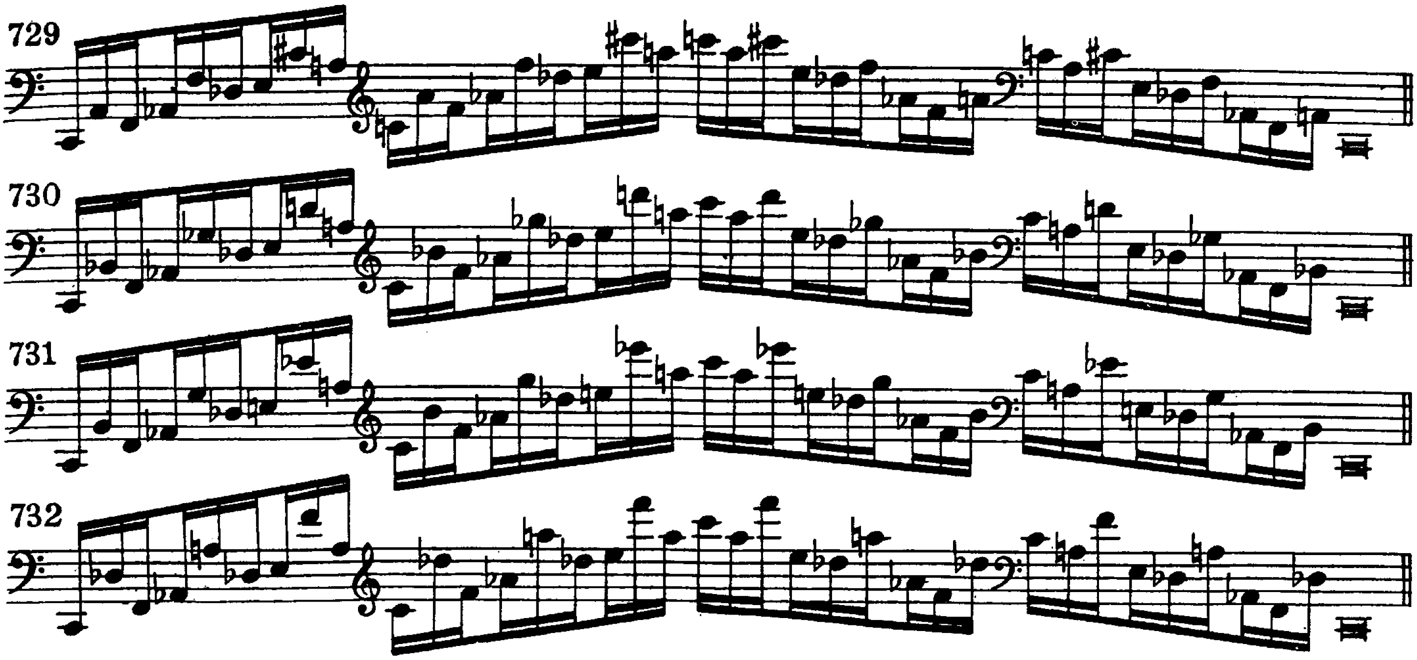


## Inter-Infrapolation
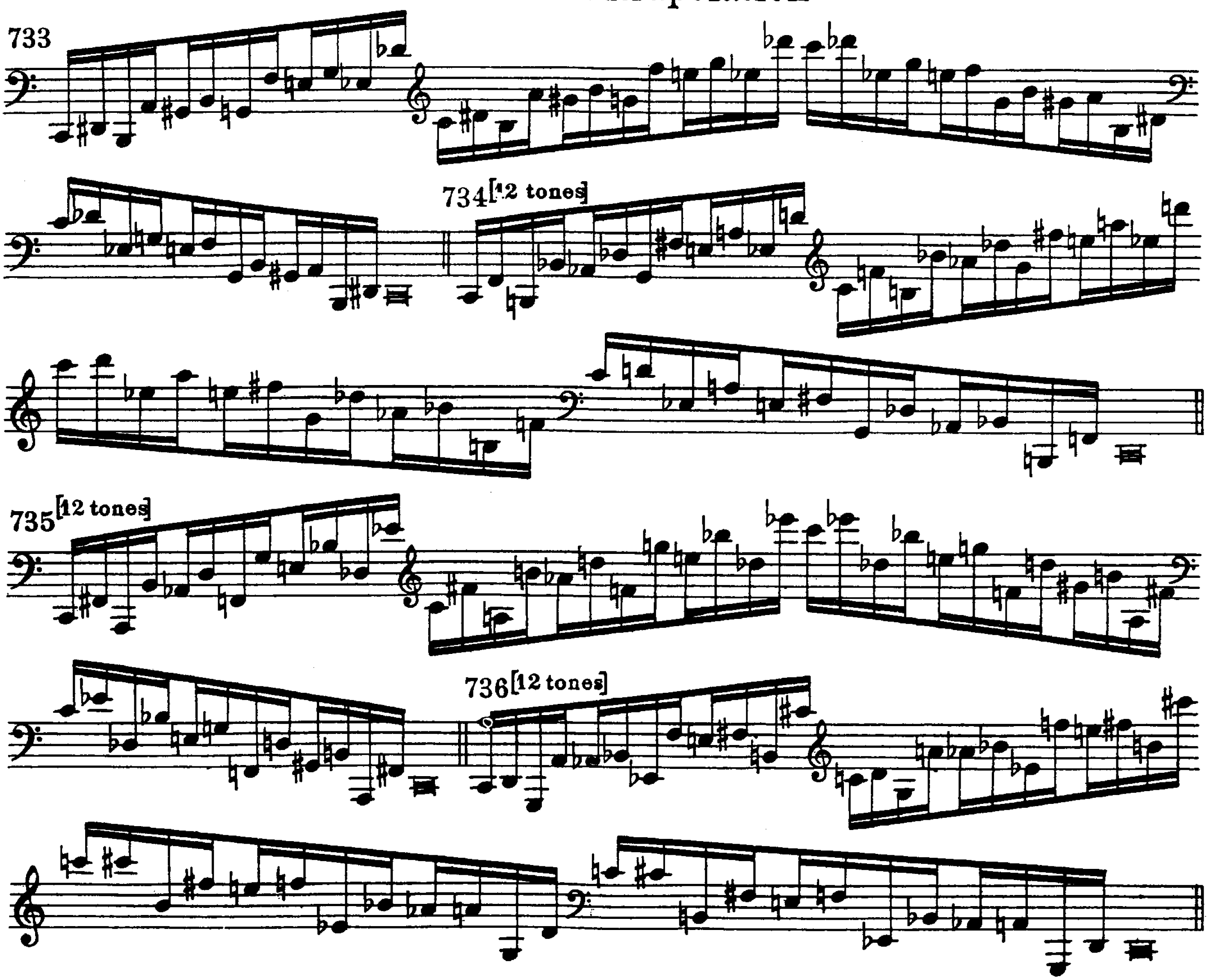


## Ultra-Interpolation






## Inter-Infra-Ultrapolation
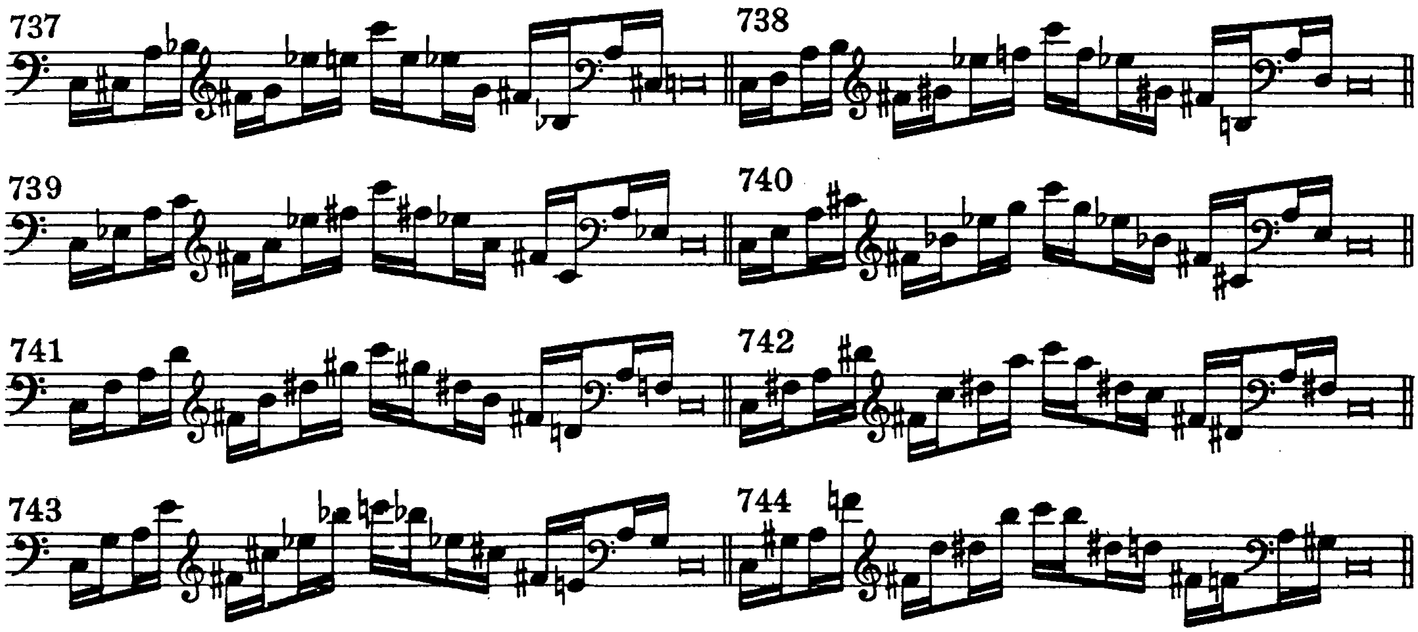


# Sesquiquadritone Progression

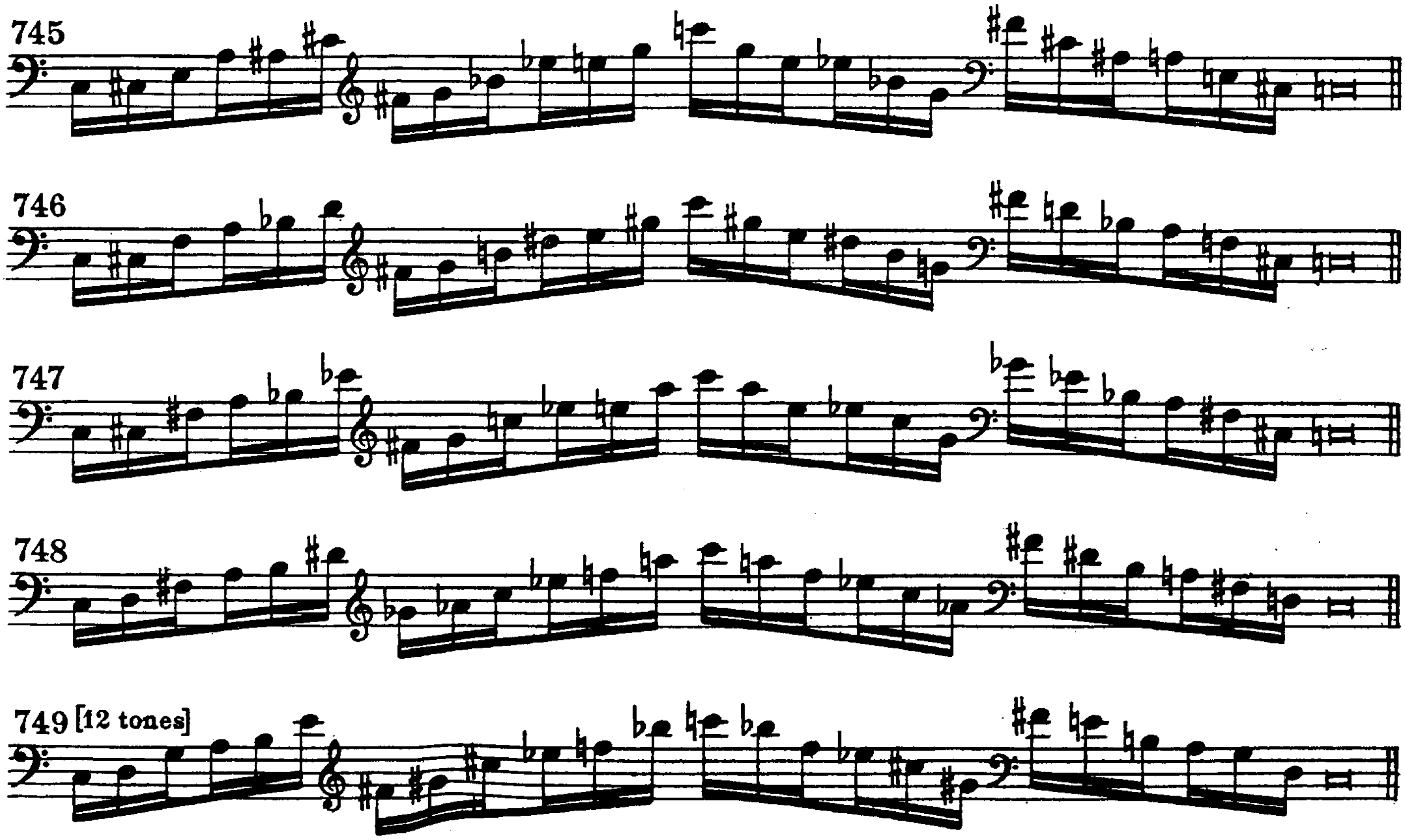
## Equal Division of Three Octaves into Four Parts



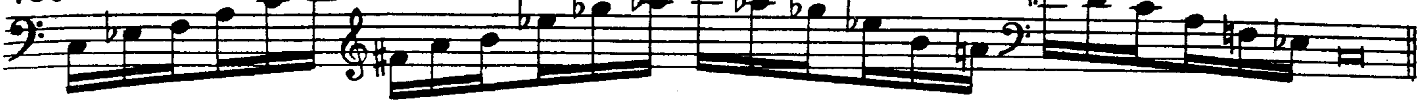
### Interpolation of One Note
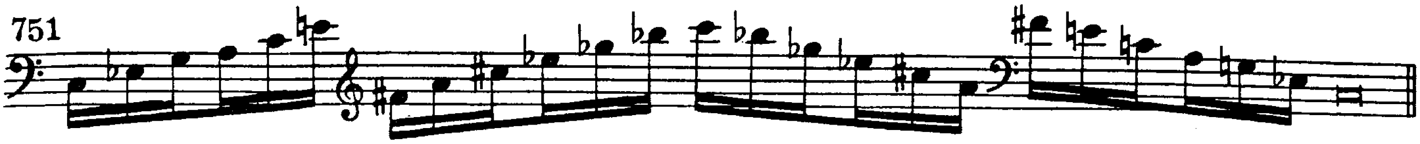



### Interpolation of Two Notes
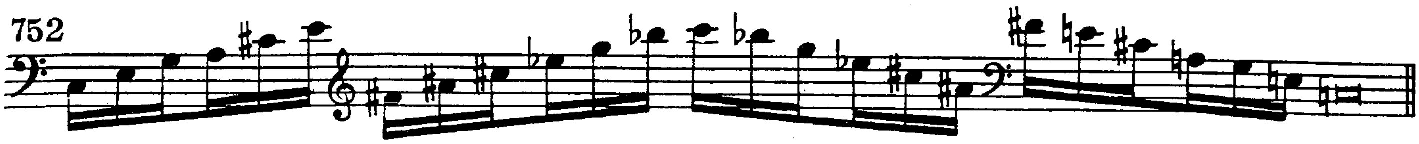


750
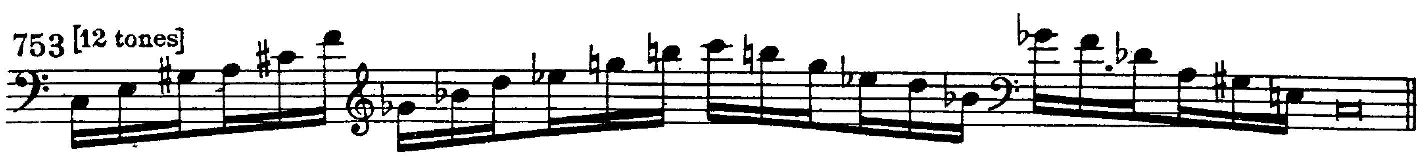


751
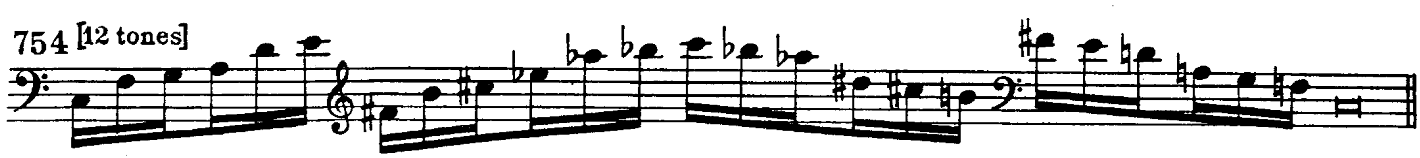


752



753 [12 tones]
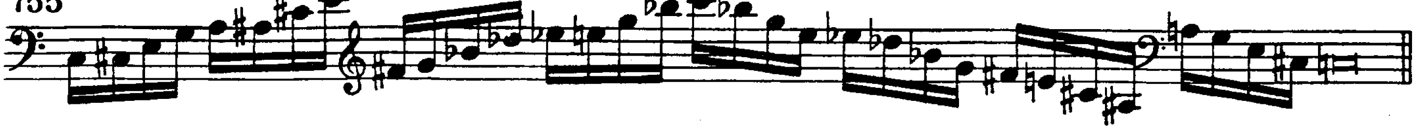


754 [12 tones]

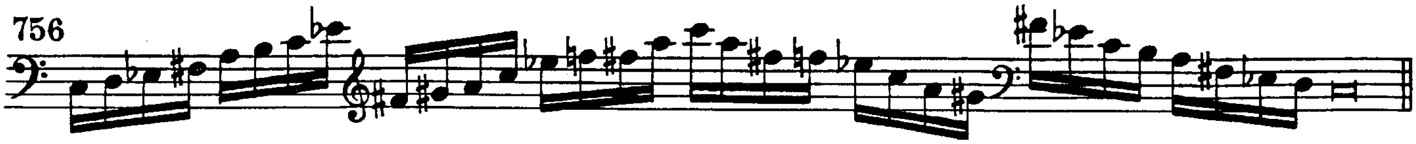


## Interpolation of Three Notes
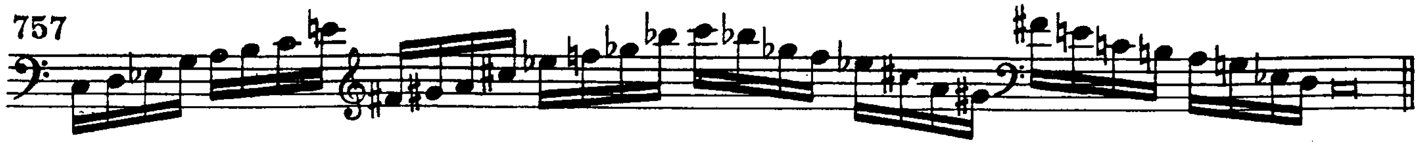
755
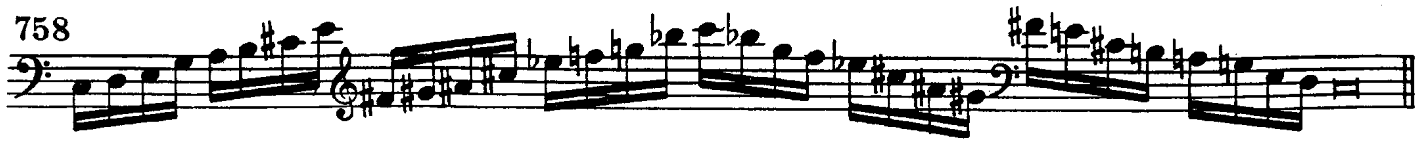


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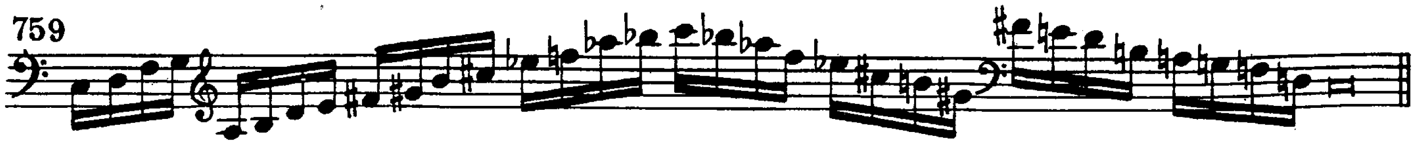


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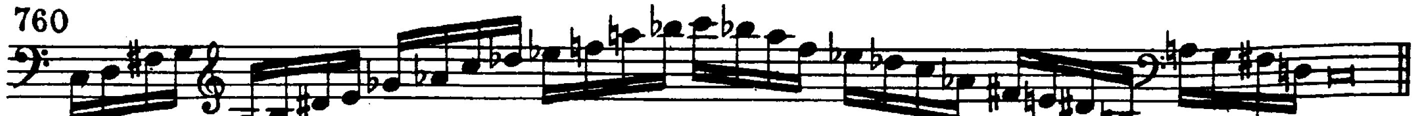


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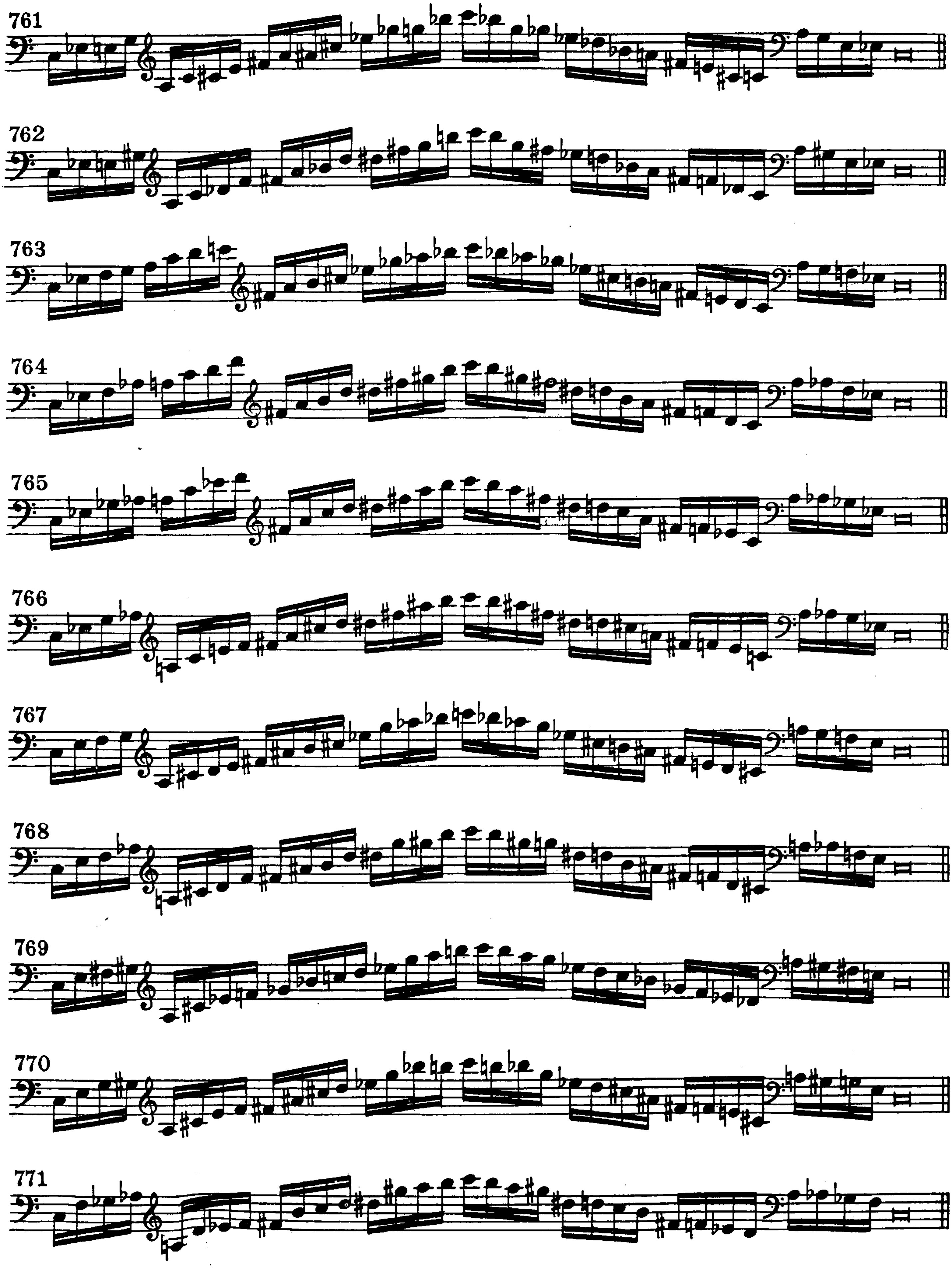


759

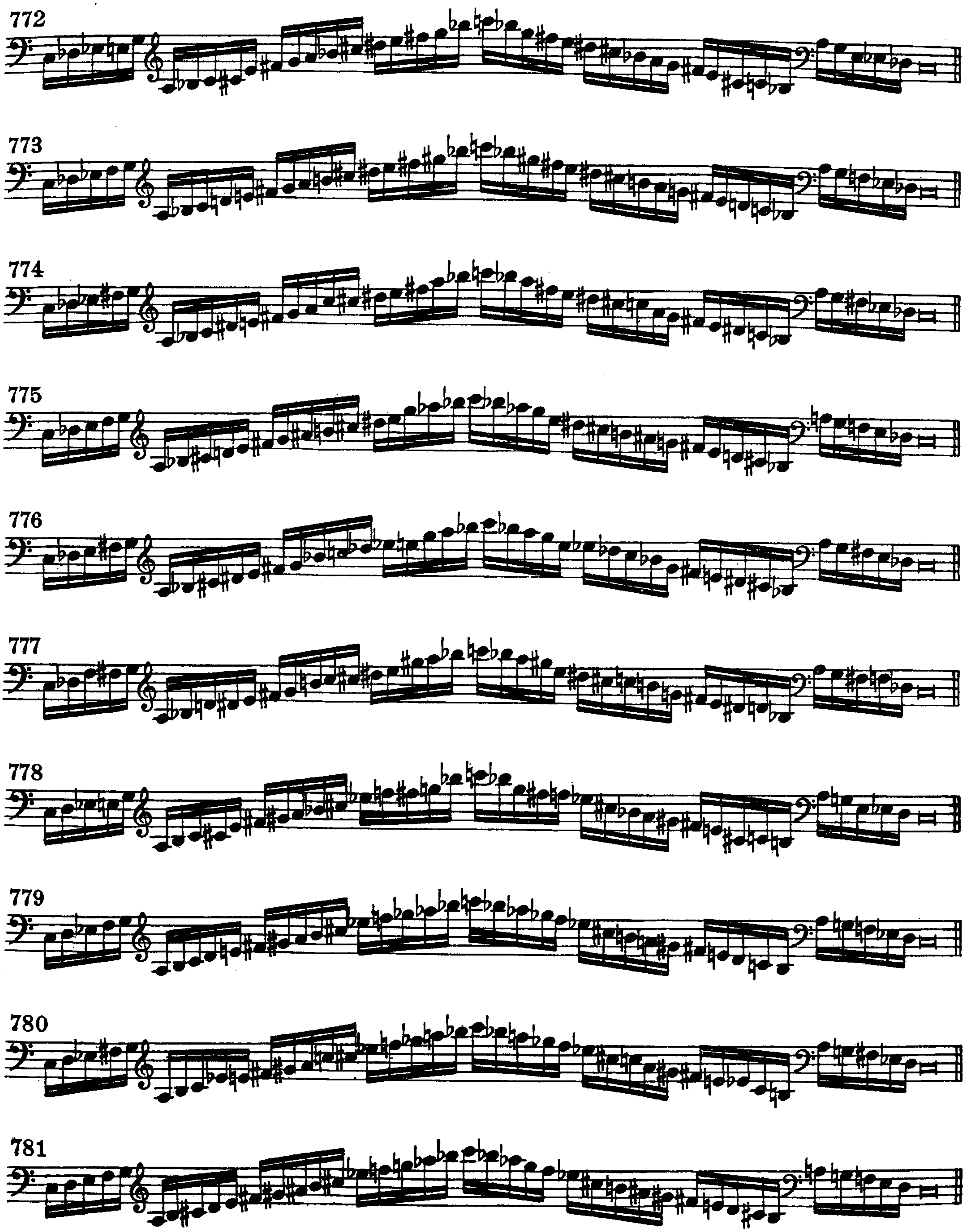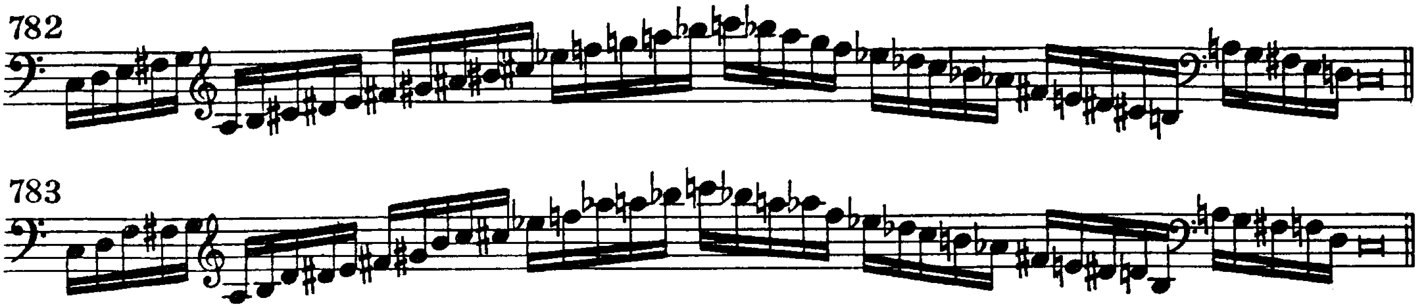


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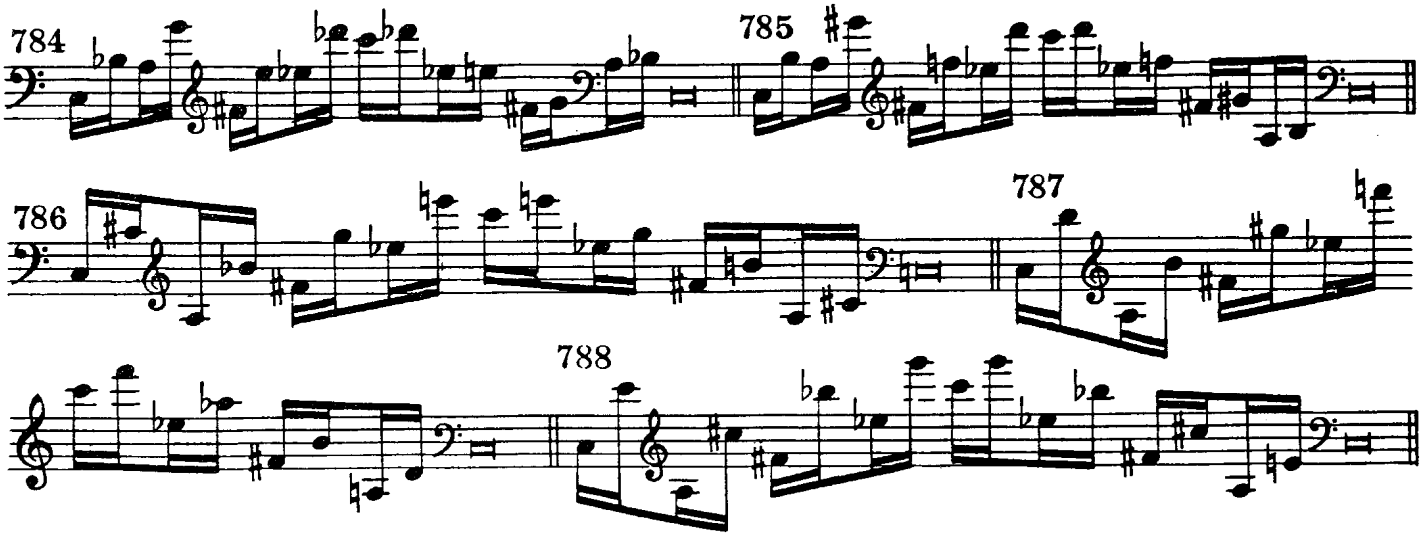



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# Interpolation of Four Notes
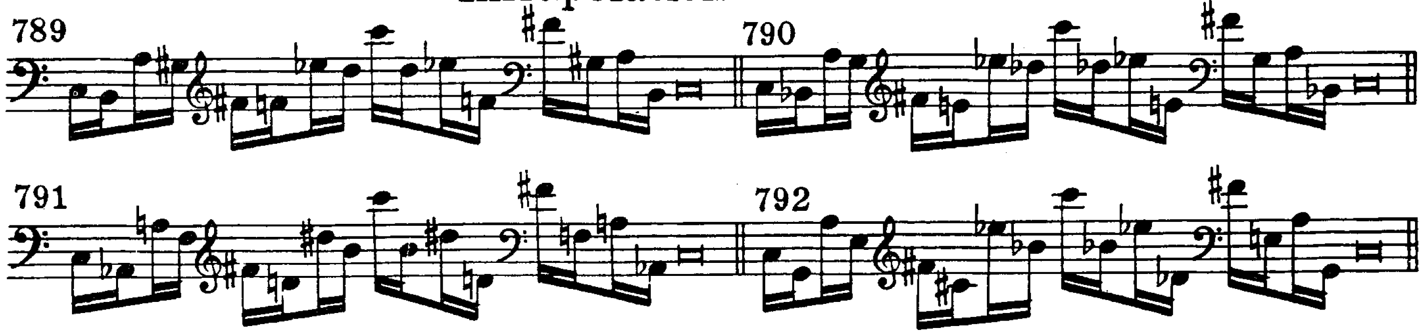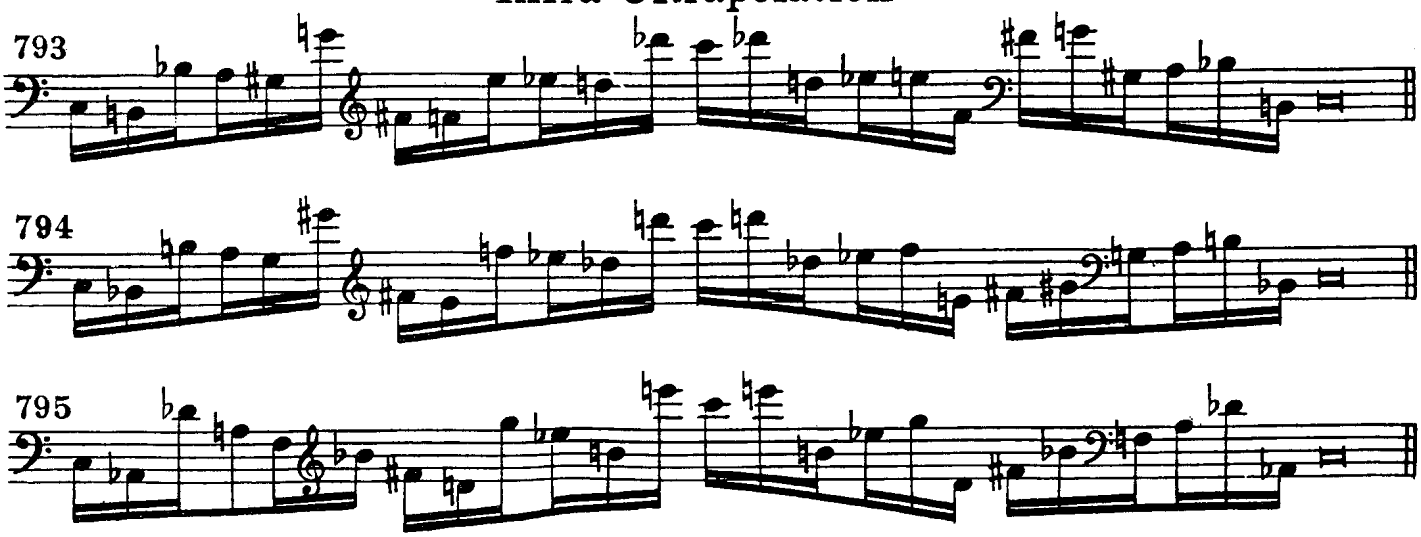





## Ultrapolation of One Note



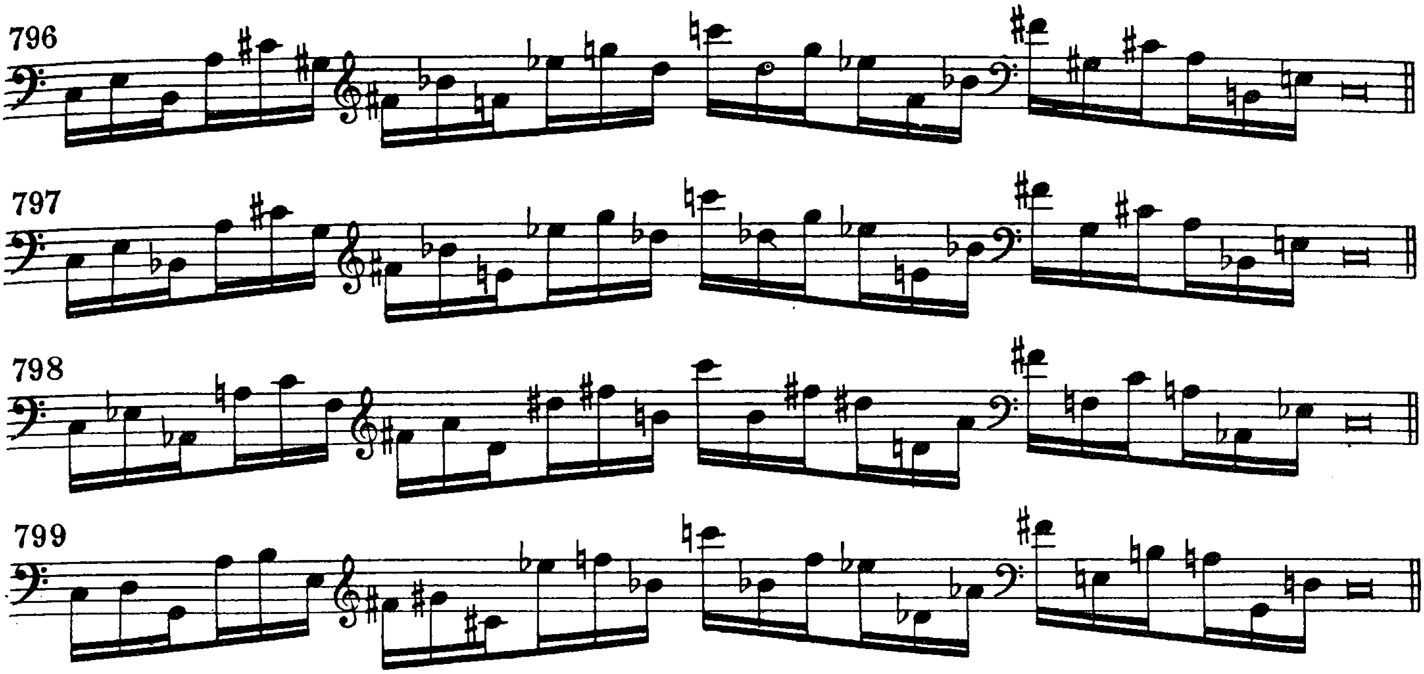

## Infrapolation of One Note
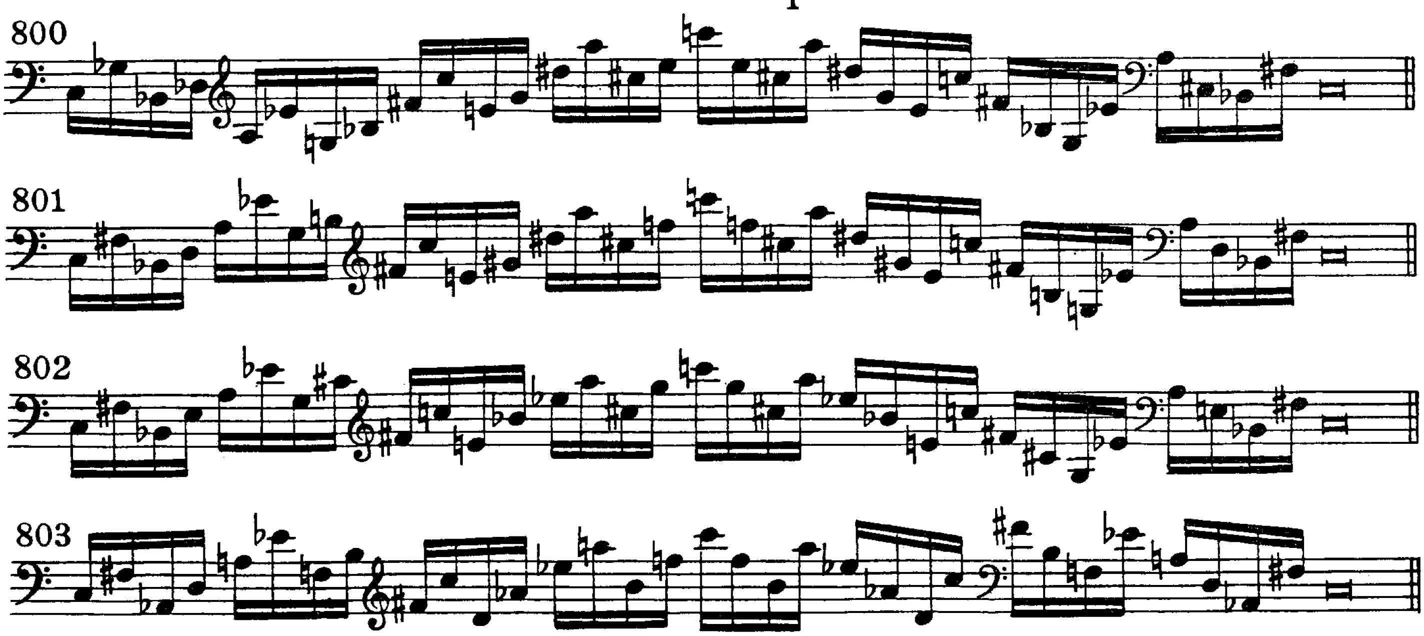



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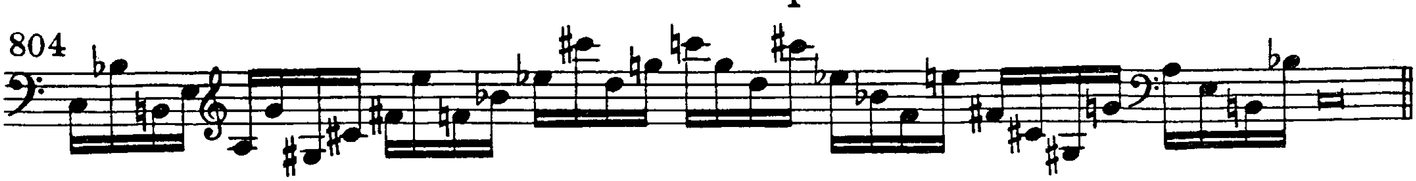


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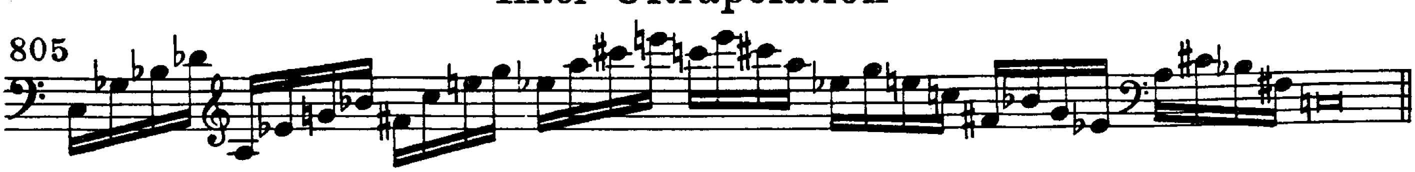



## Inter-Infra-Interpolation




## Ultra-Infra-Interpolation
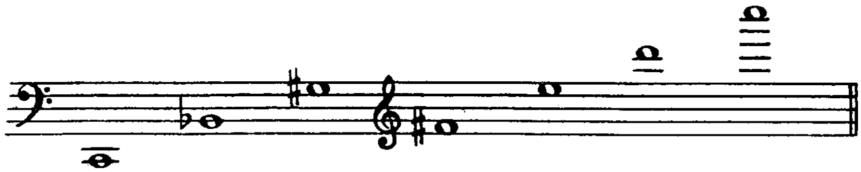



## Inter-Ultrapolation
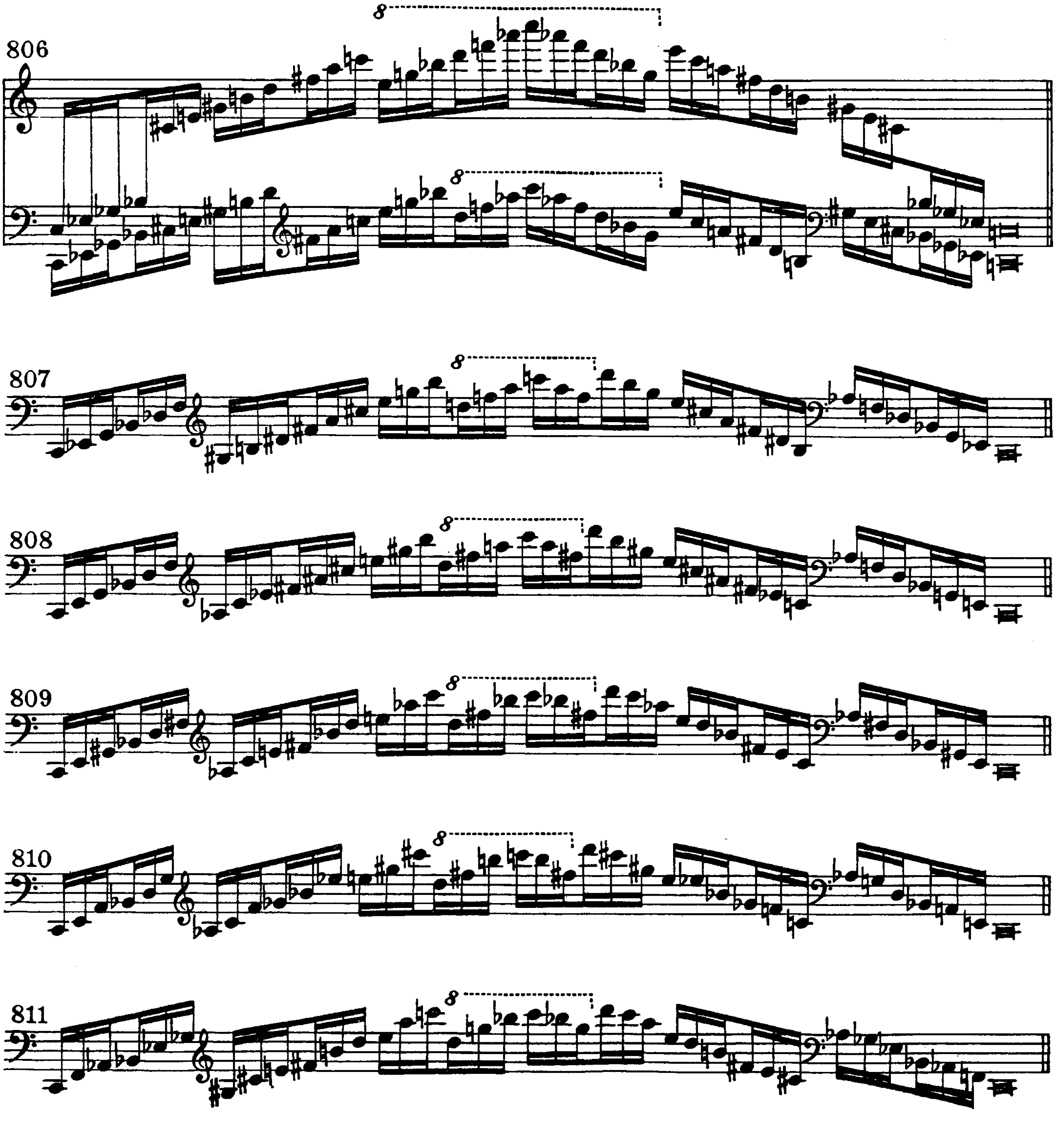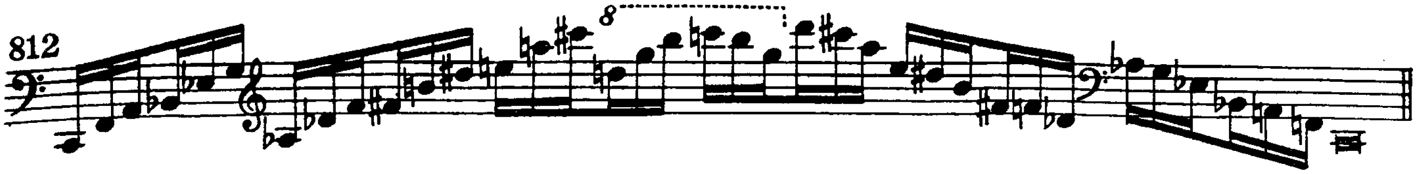


# Quinquetone Progression

## Equal Division of Five Octaves into Six Parts

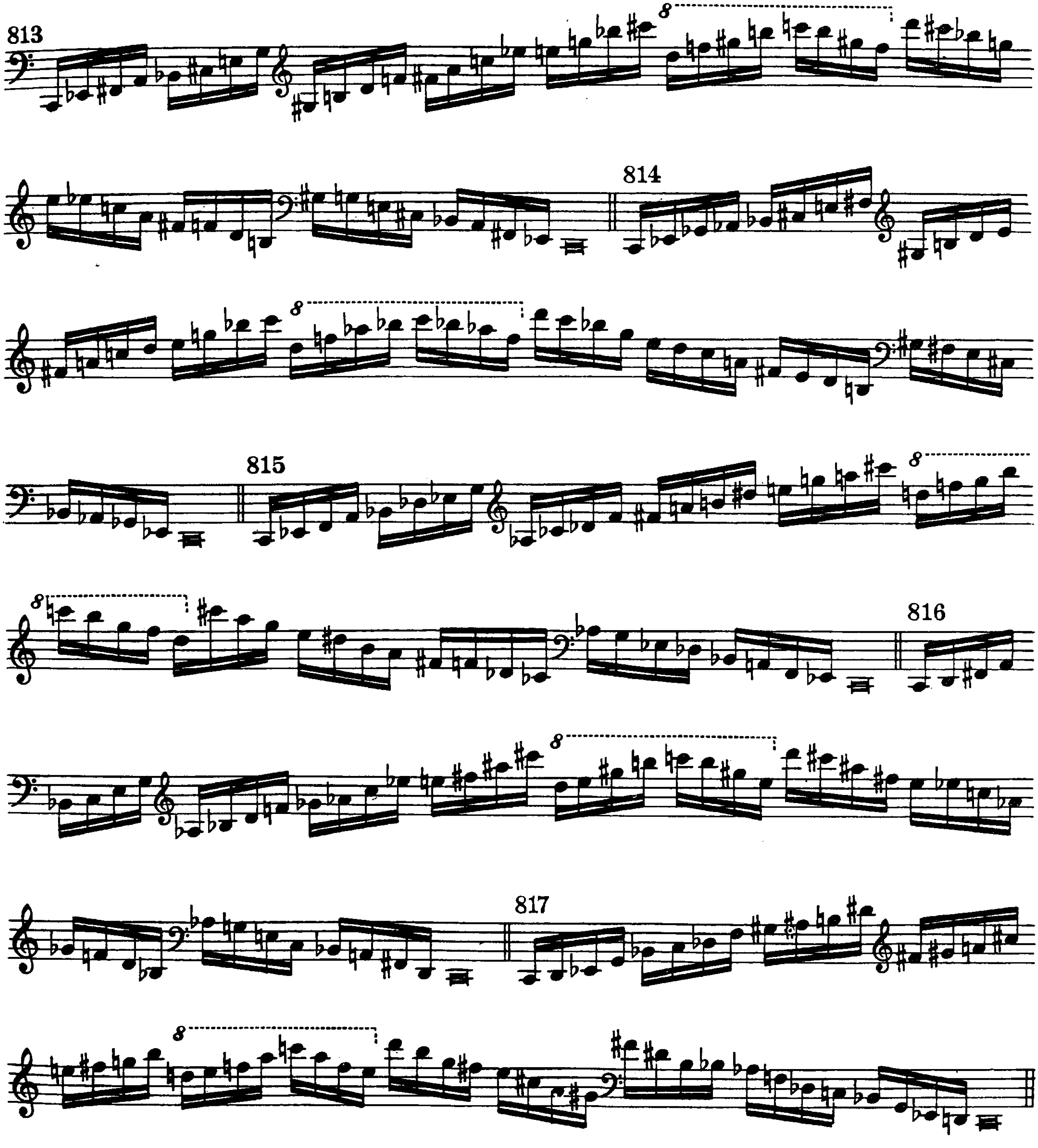


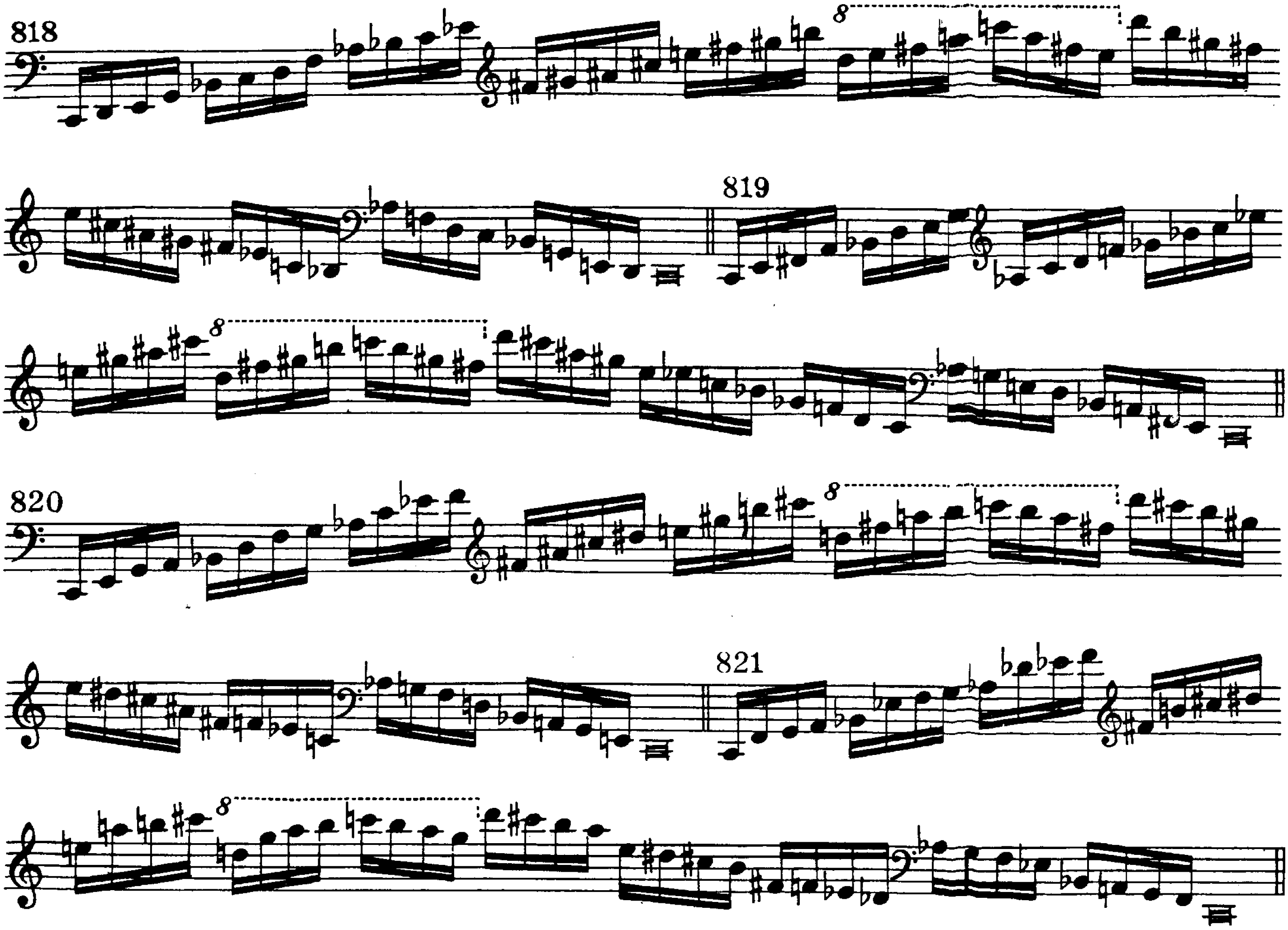
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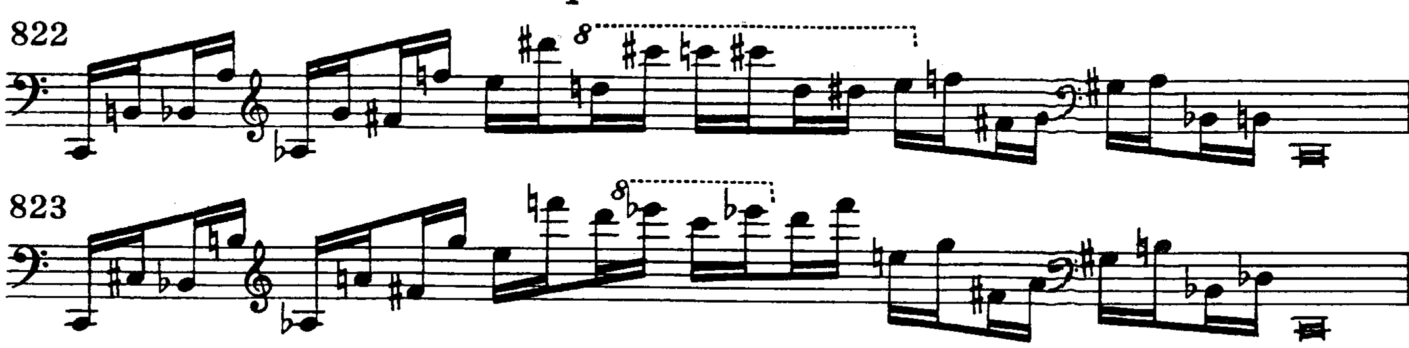





## Interpolation of Three Notes
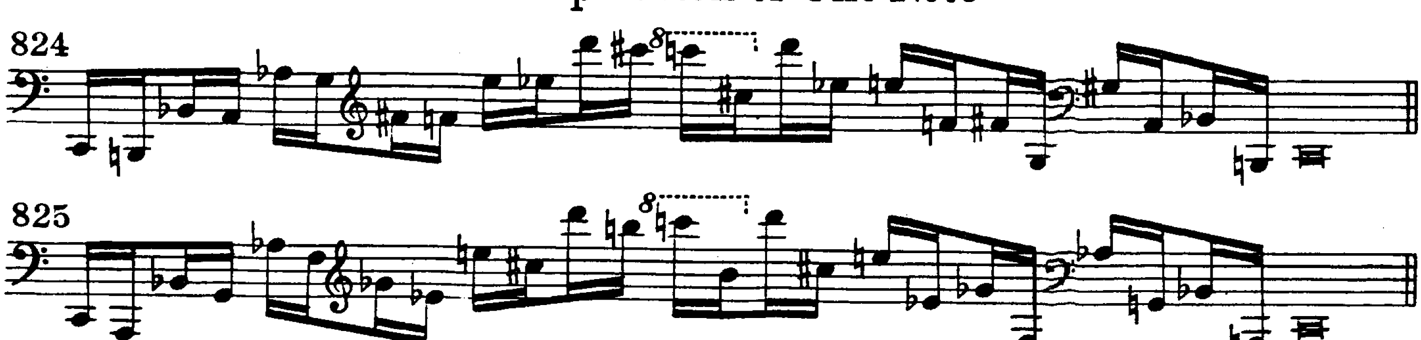





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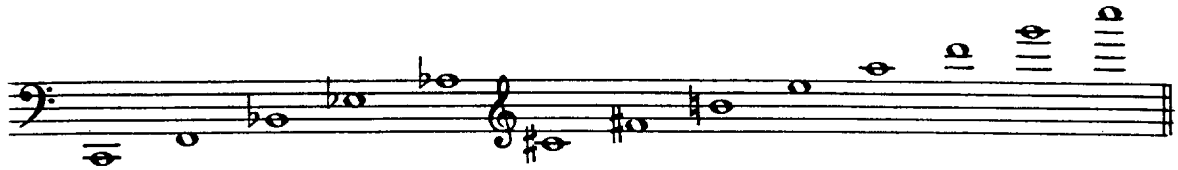



## Infrapolation of One Note

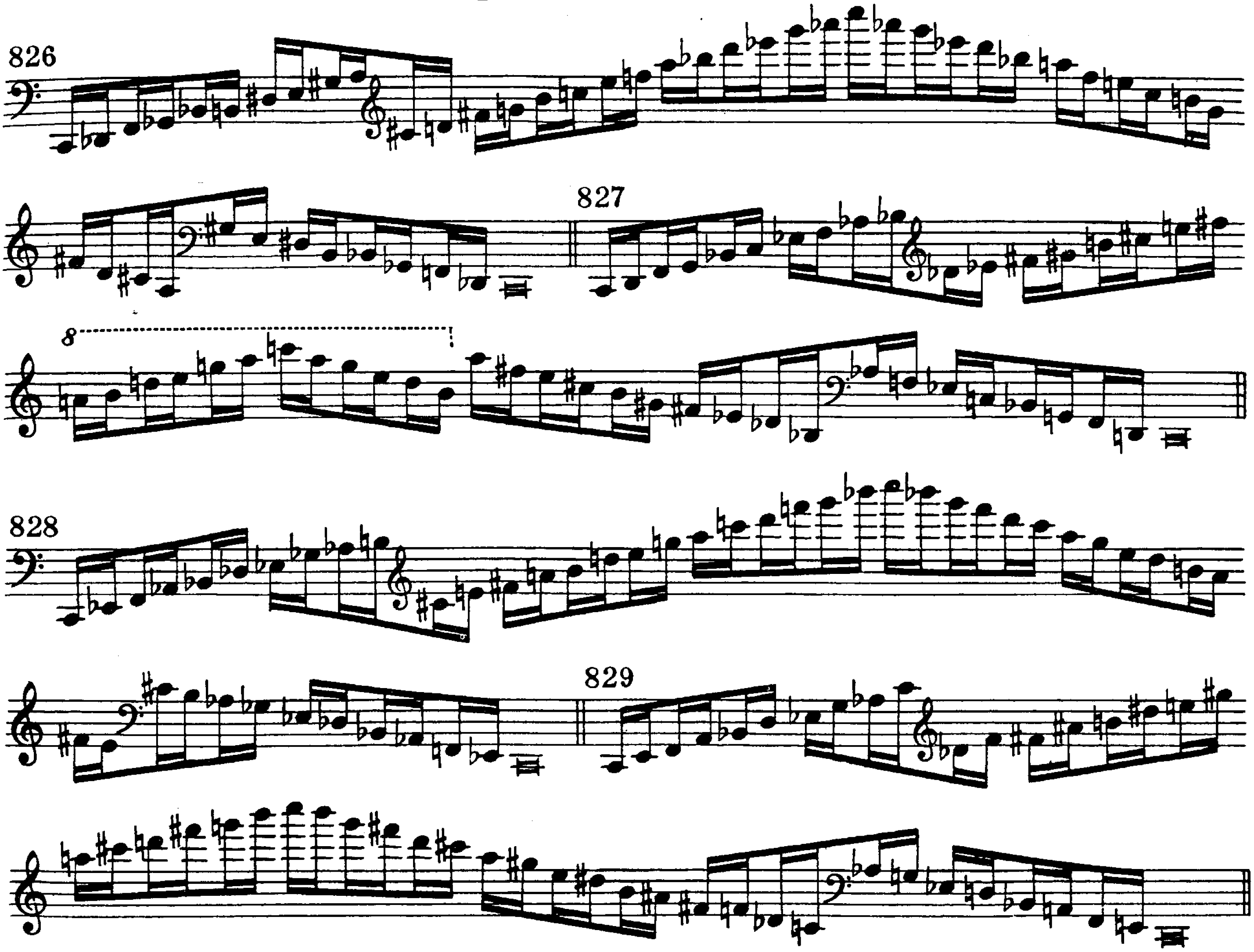


# Diatessaron Progression

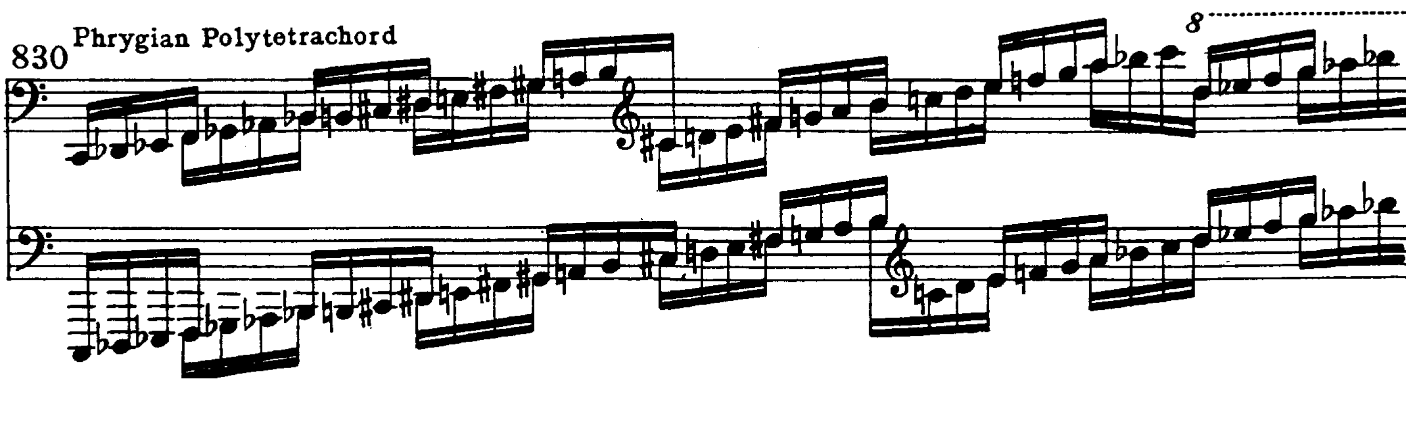
## Equal Division of Five Octaves into Twelve Parts

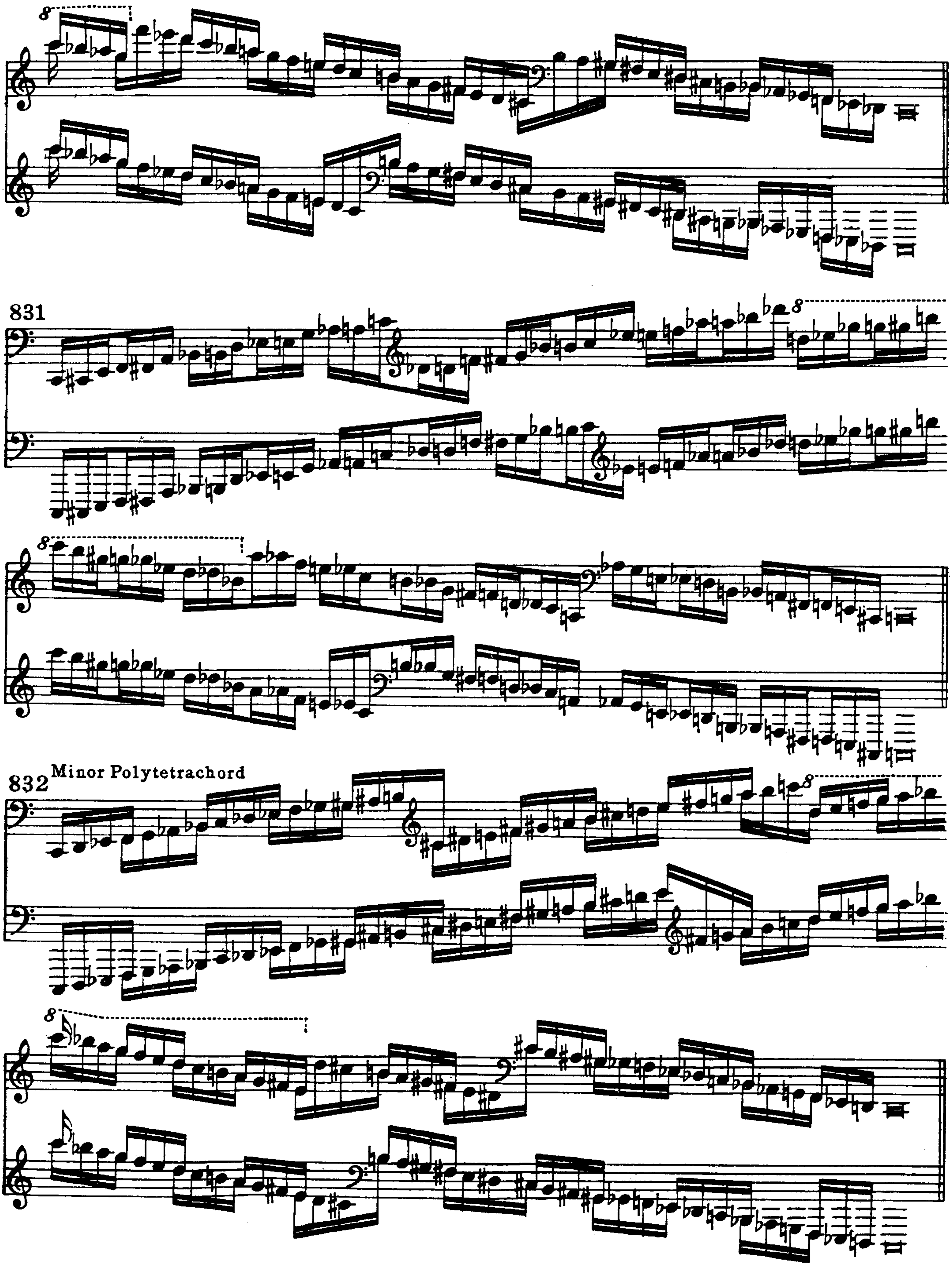


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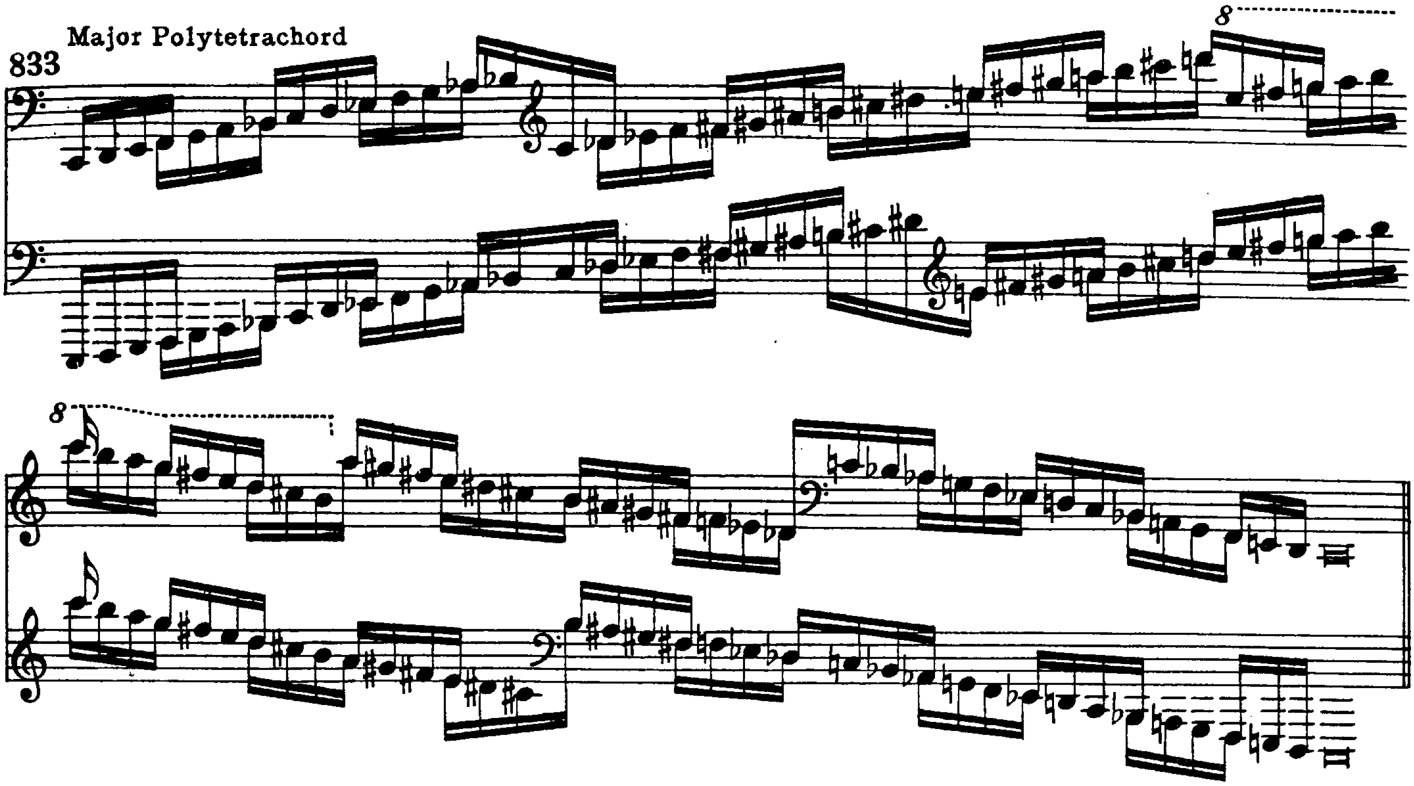



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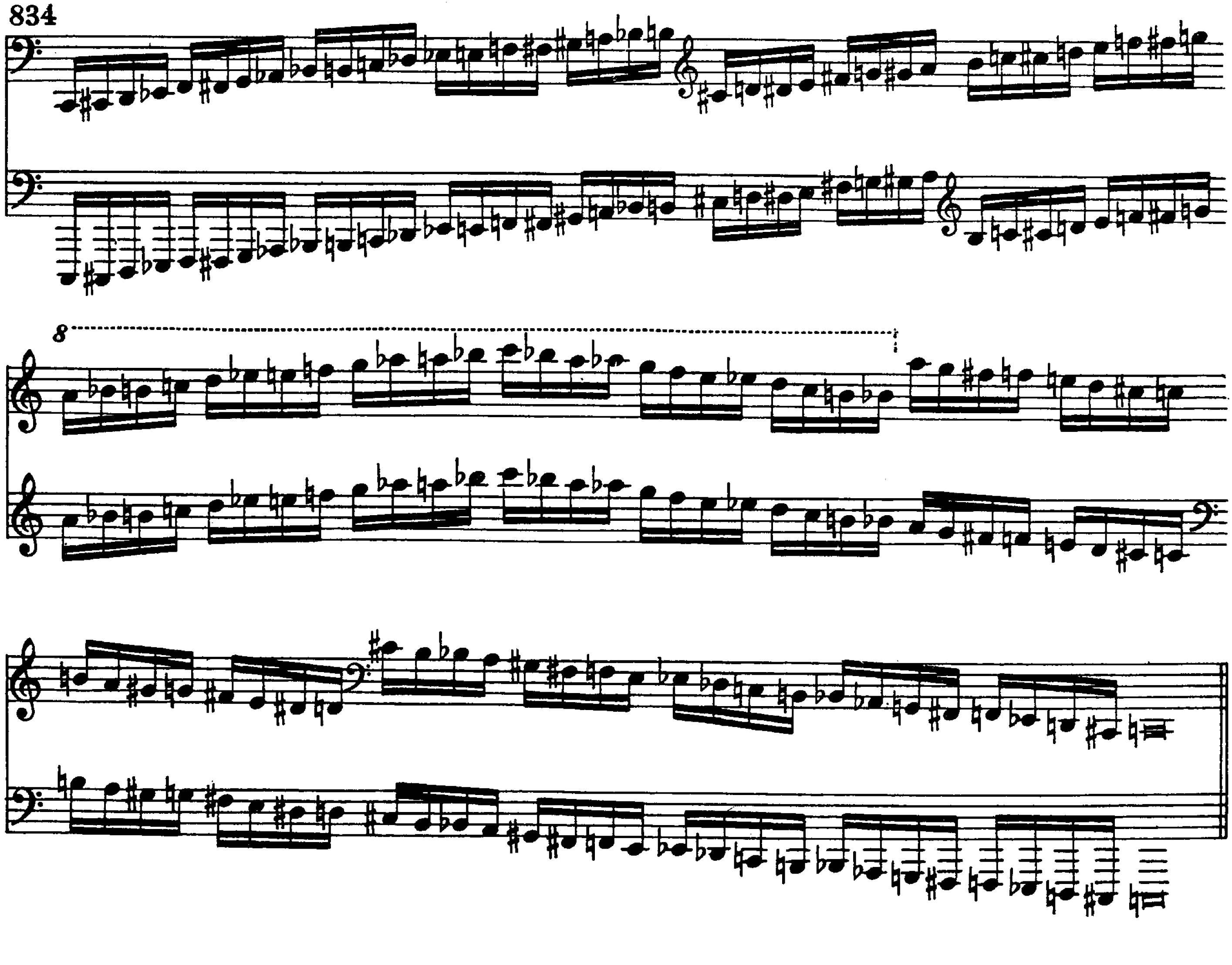



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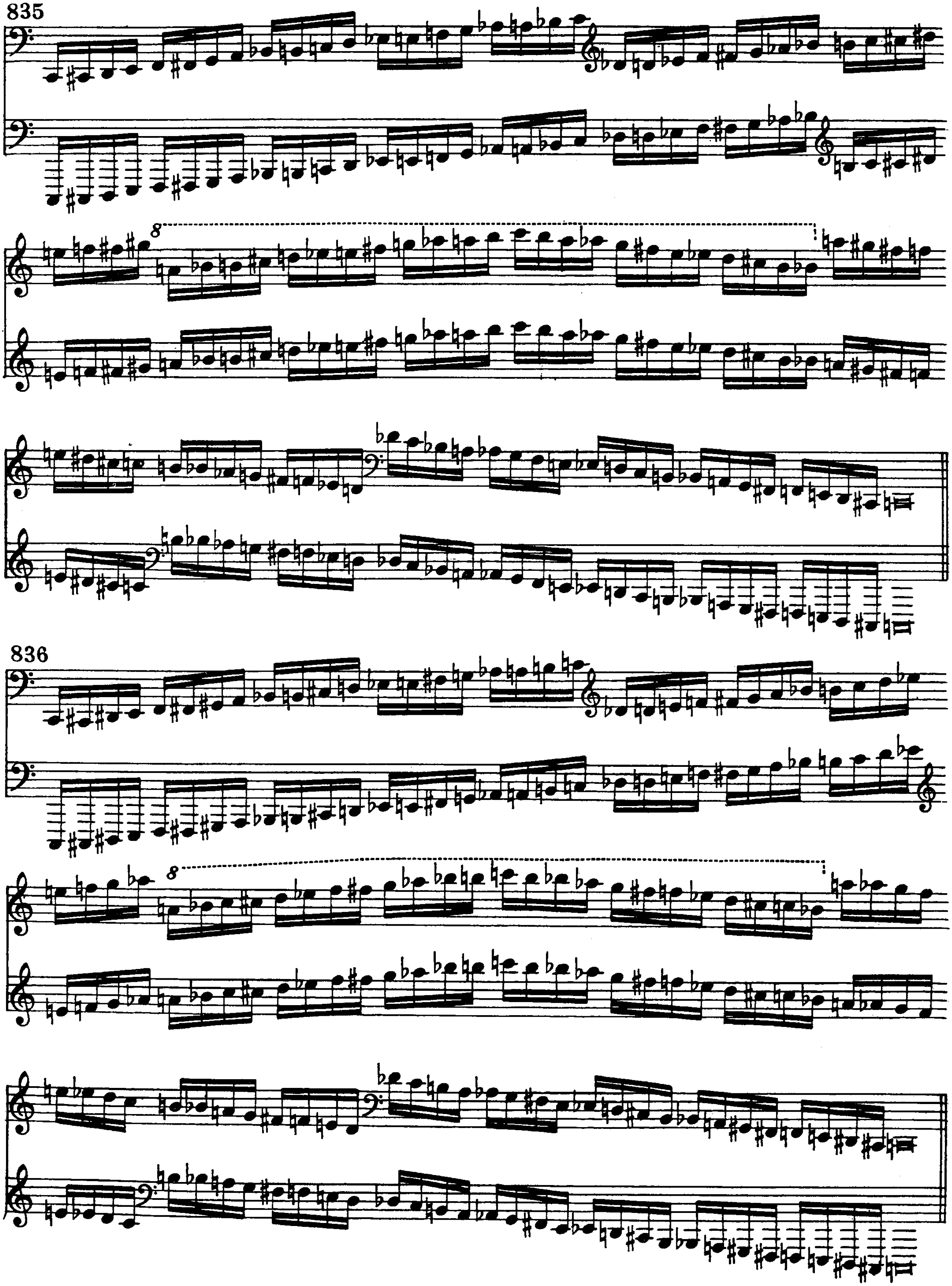
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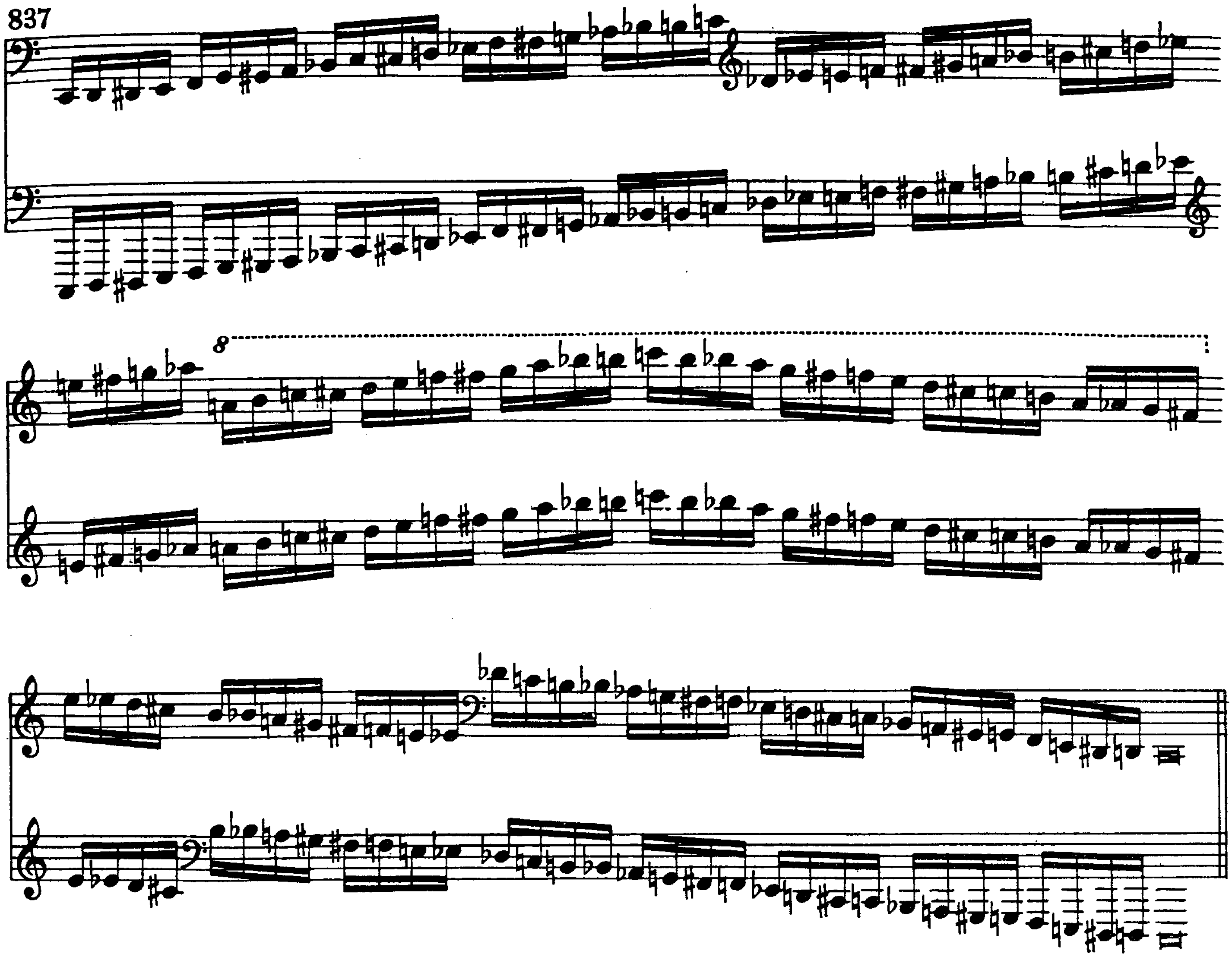
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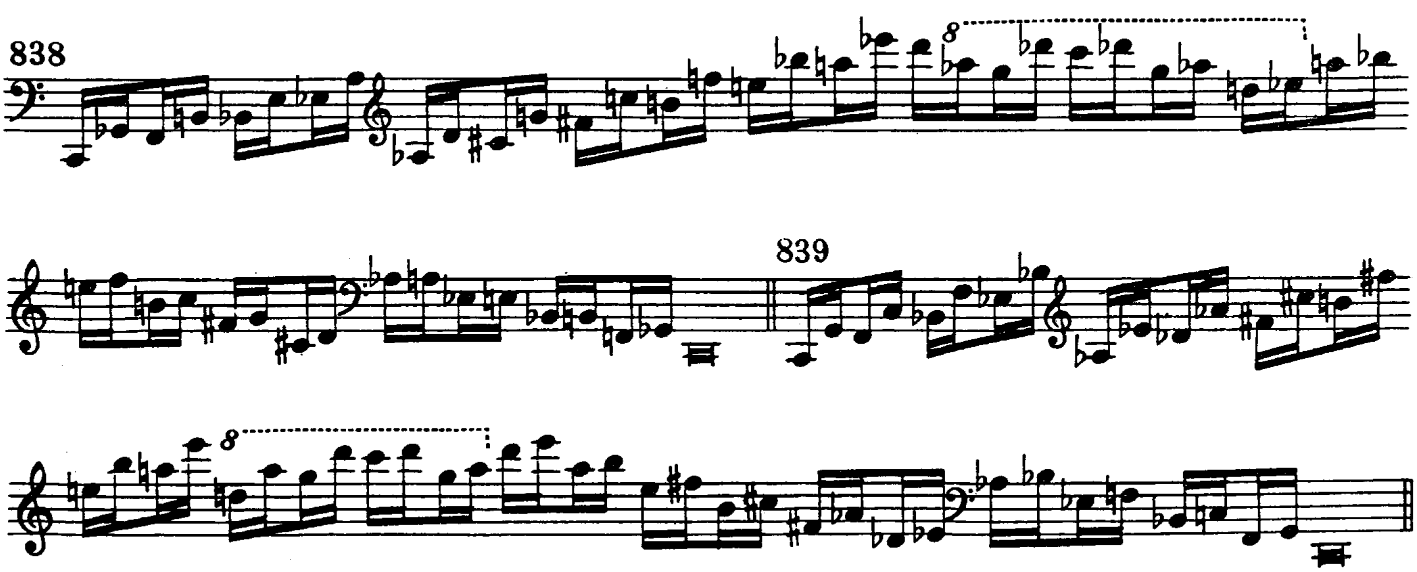


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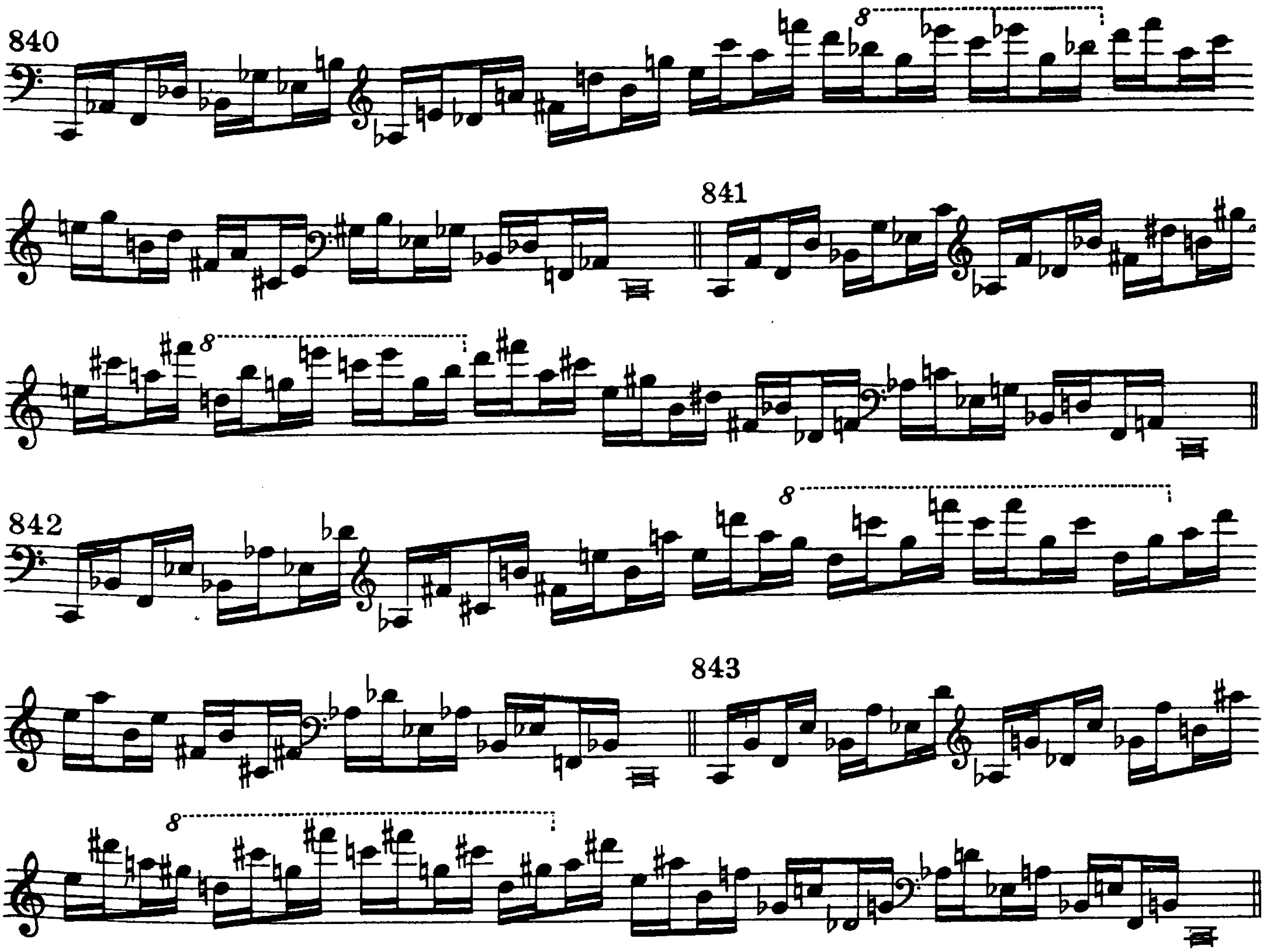



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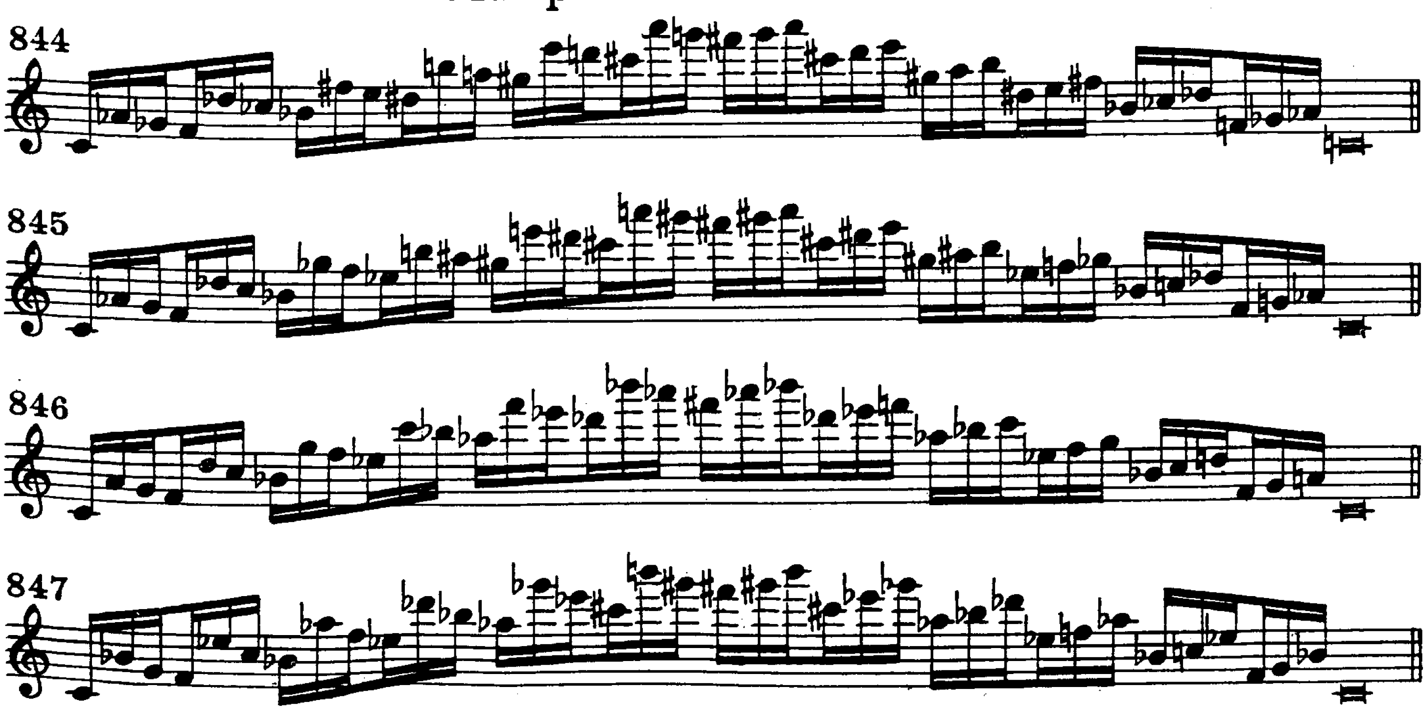


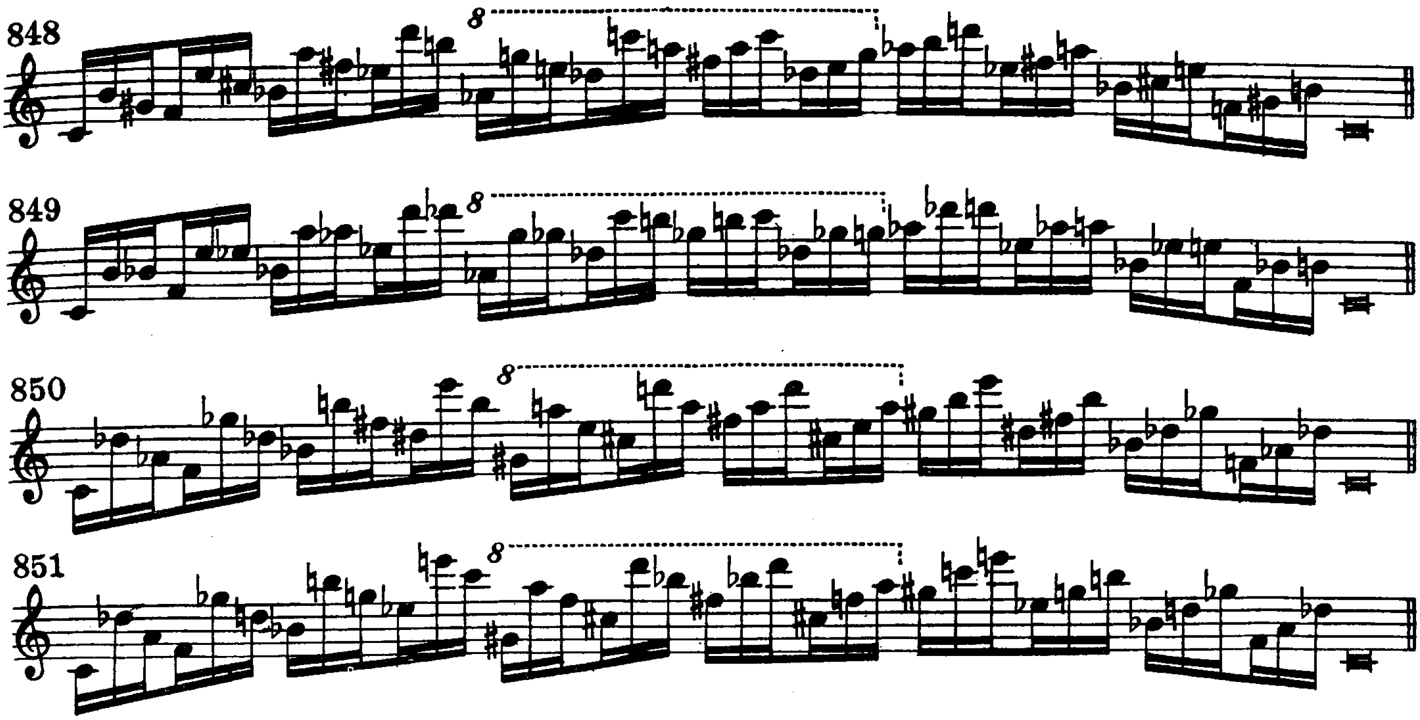

## Ultrapolation of One Note
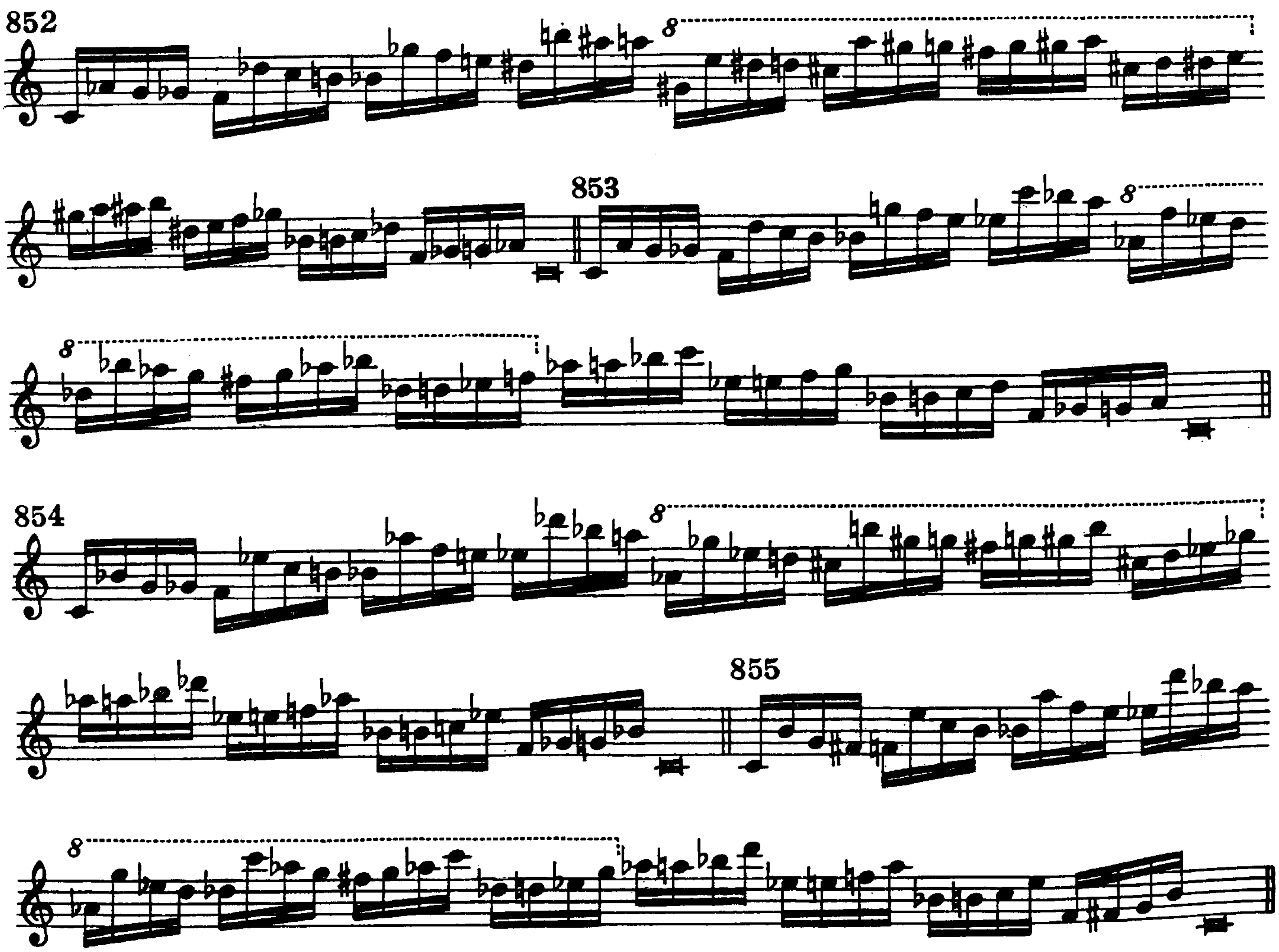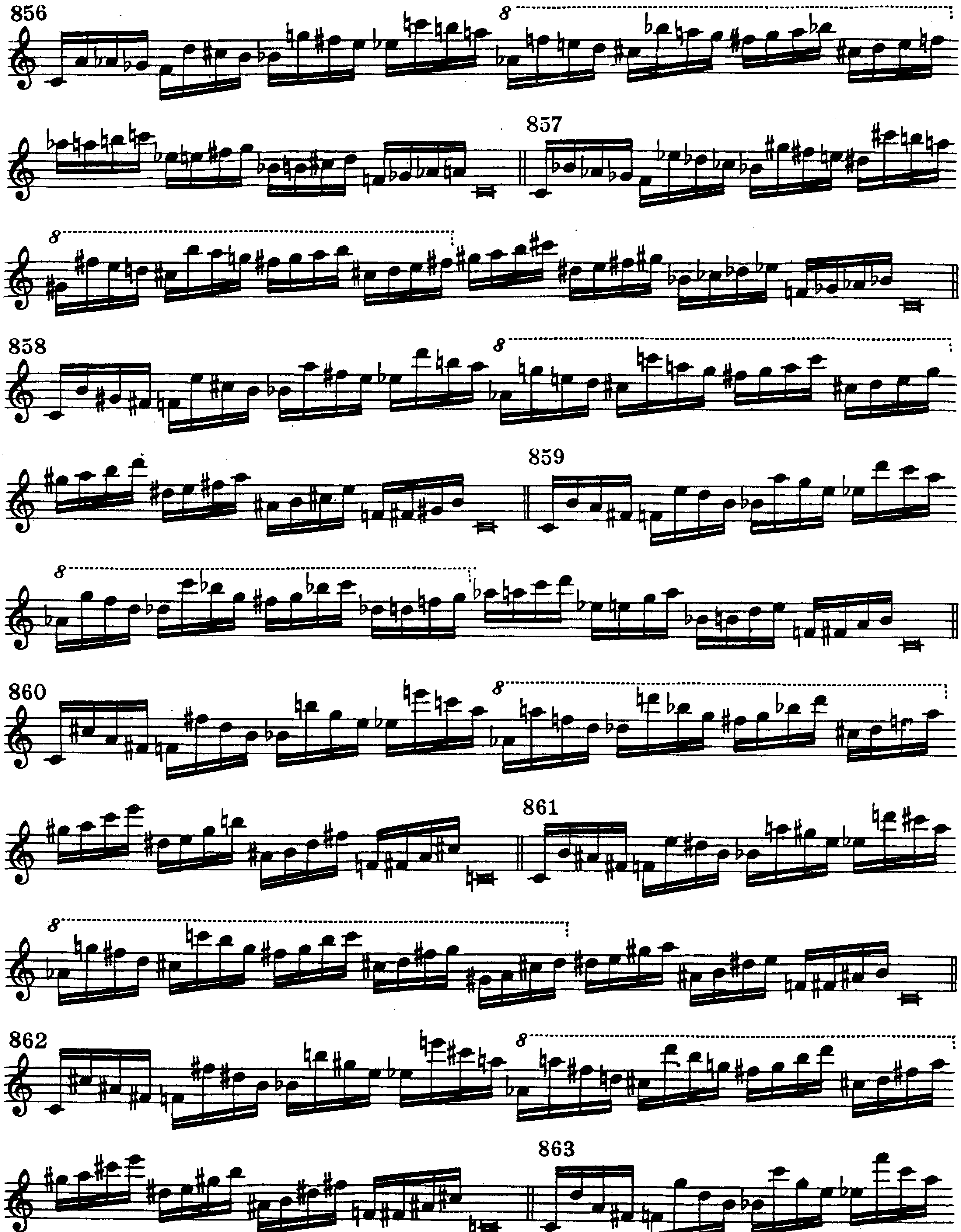





## Ultrapolation of Two Notes
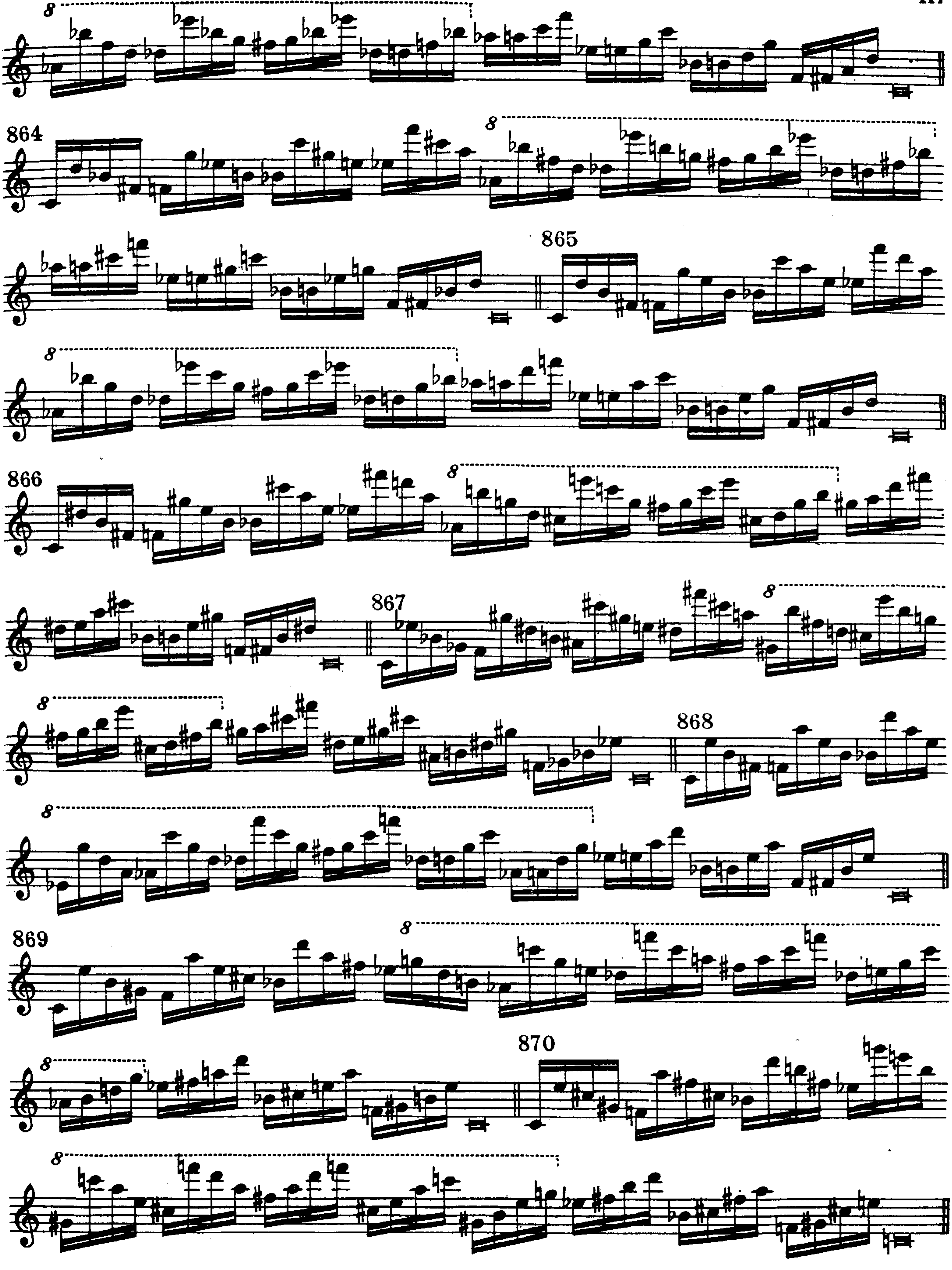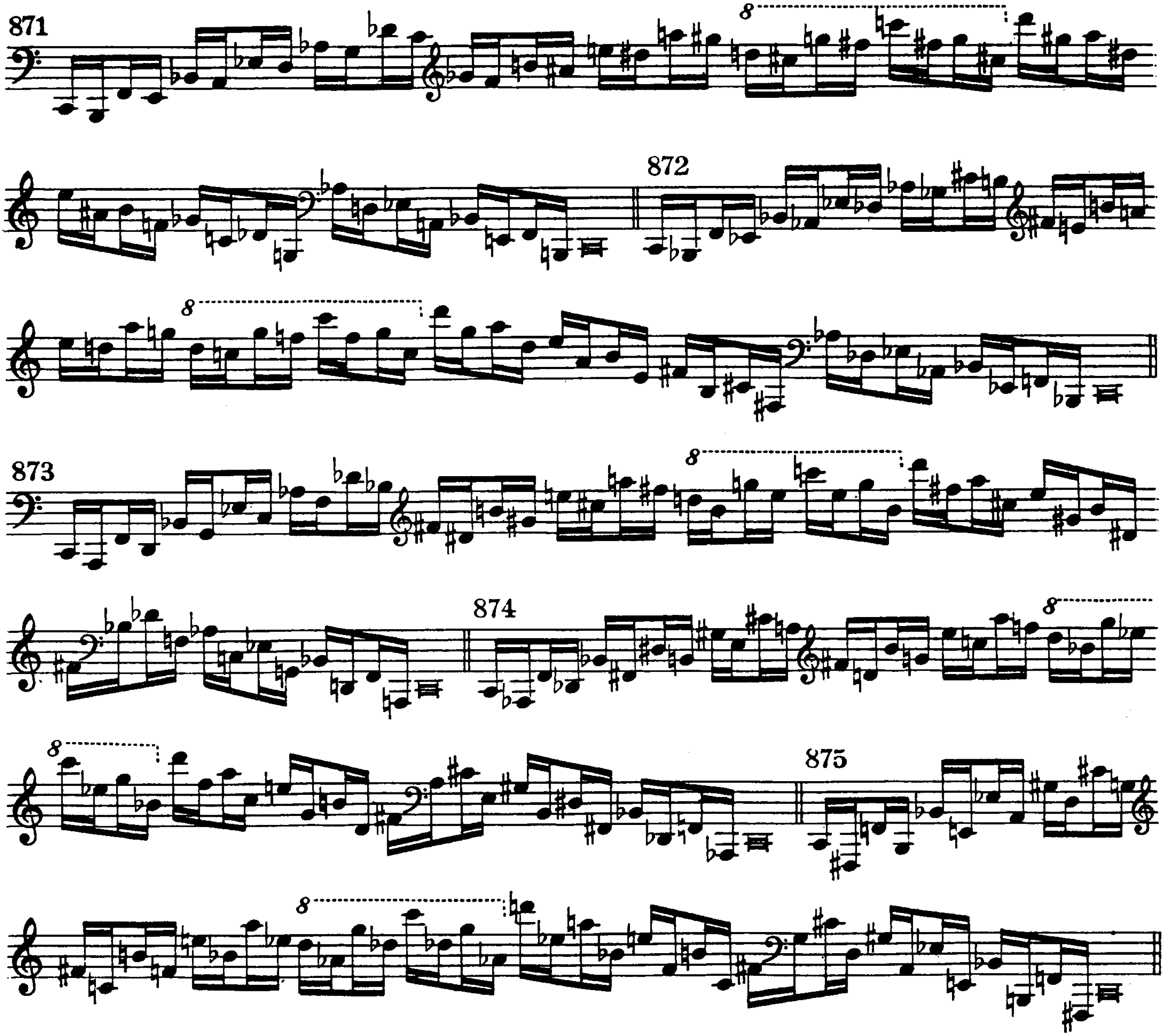





## Ultrapolation of Three Notes
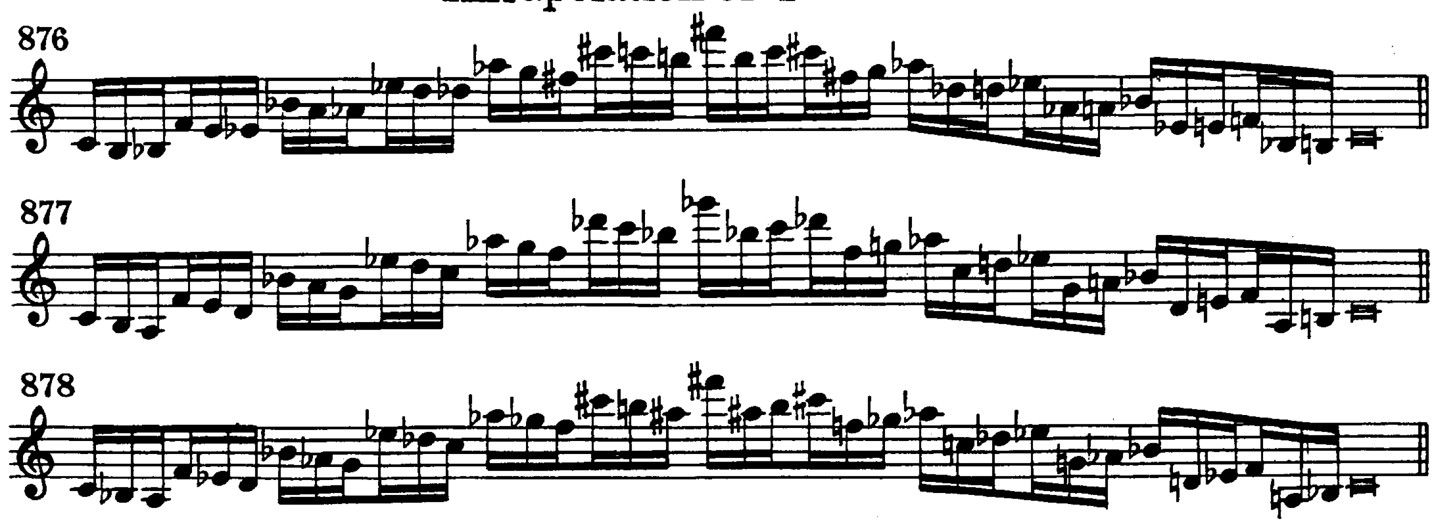



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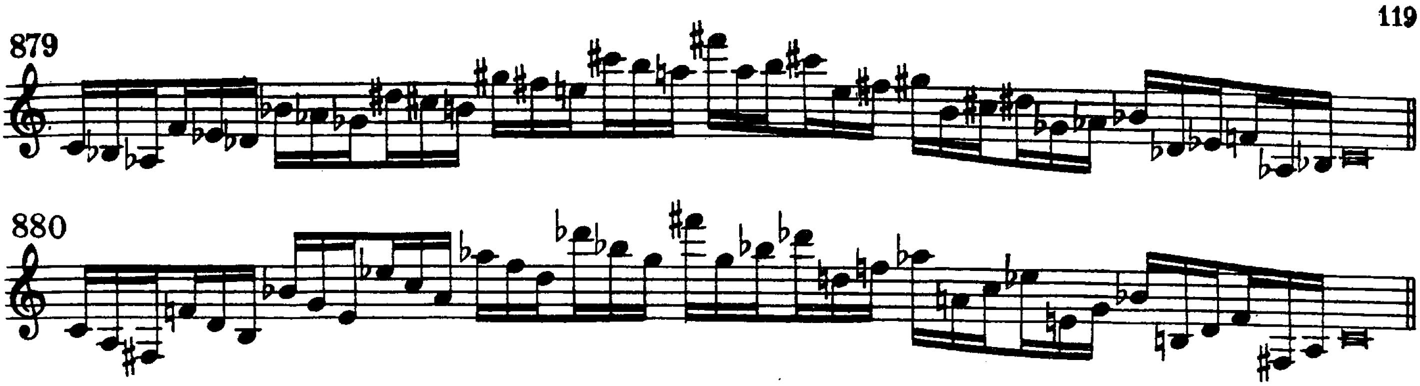

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# Infrapolation of One Note
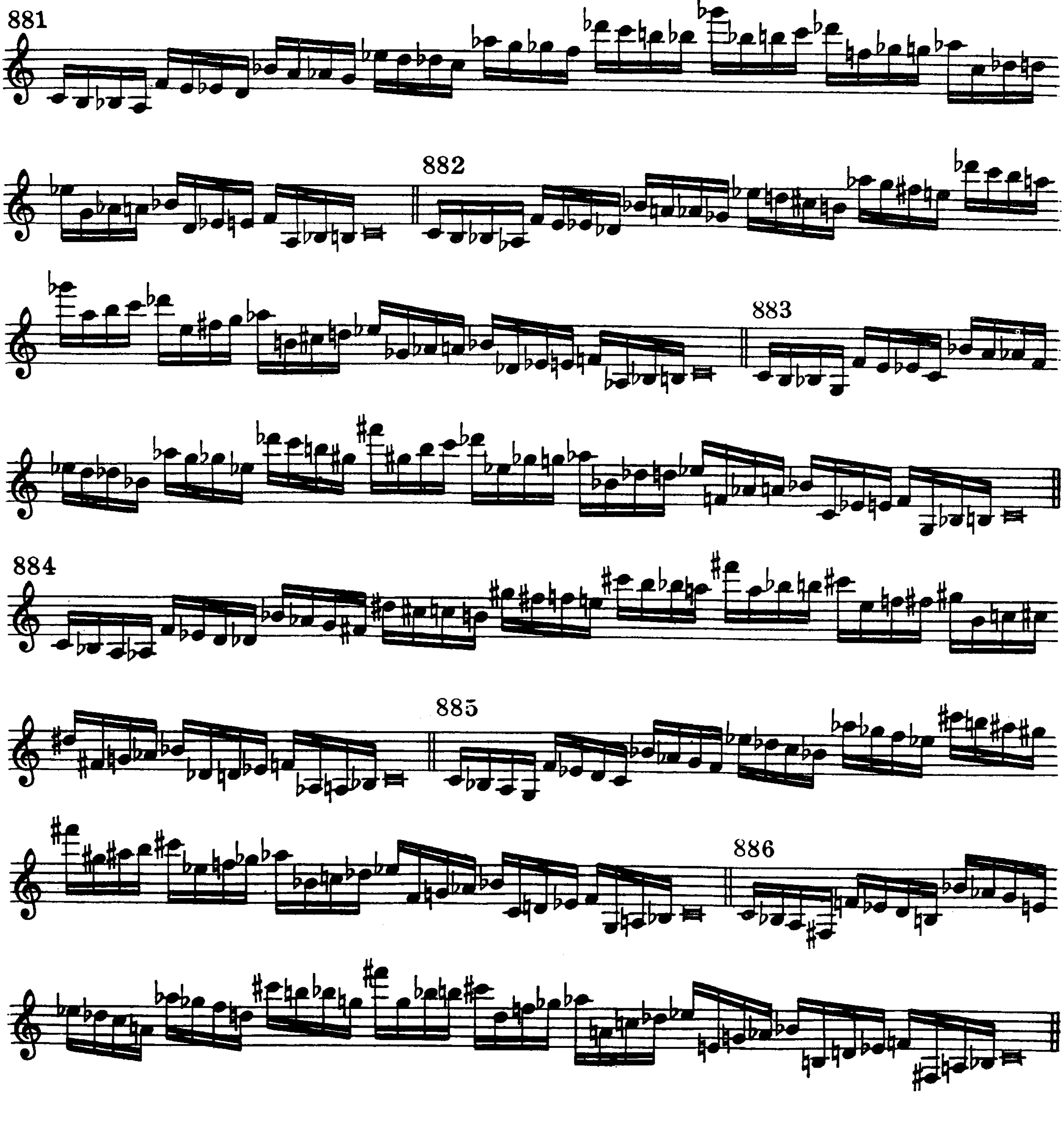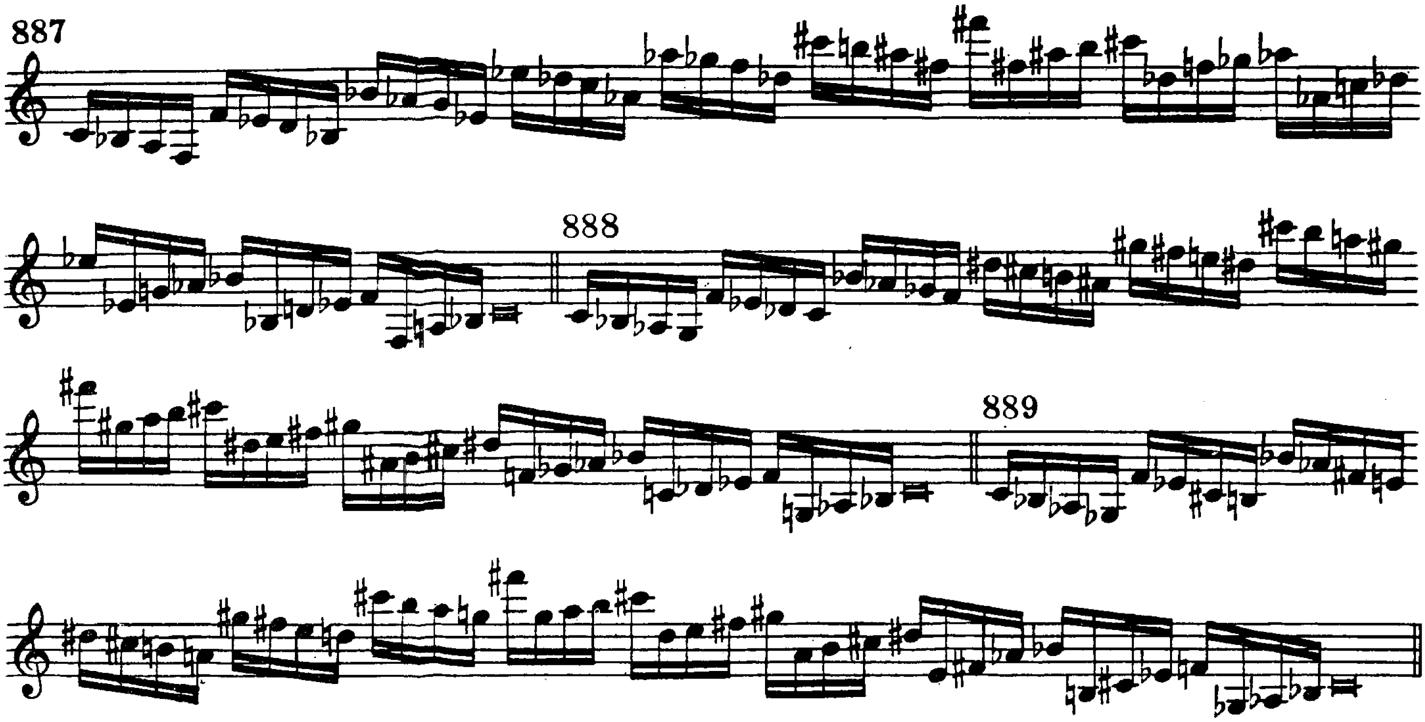



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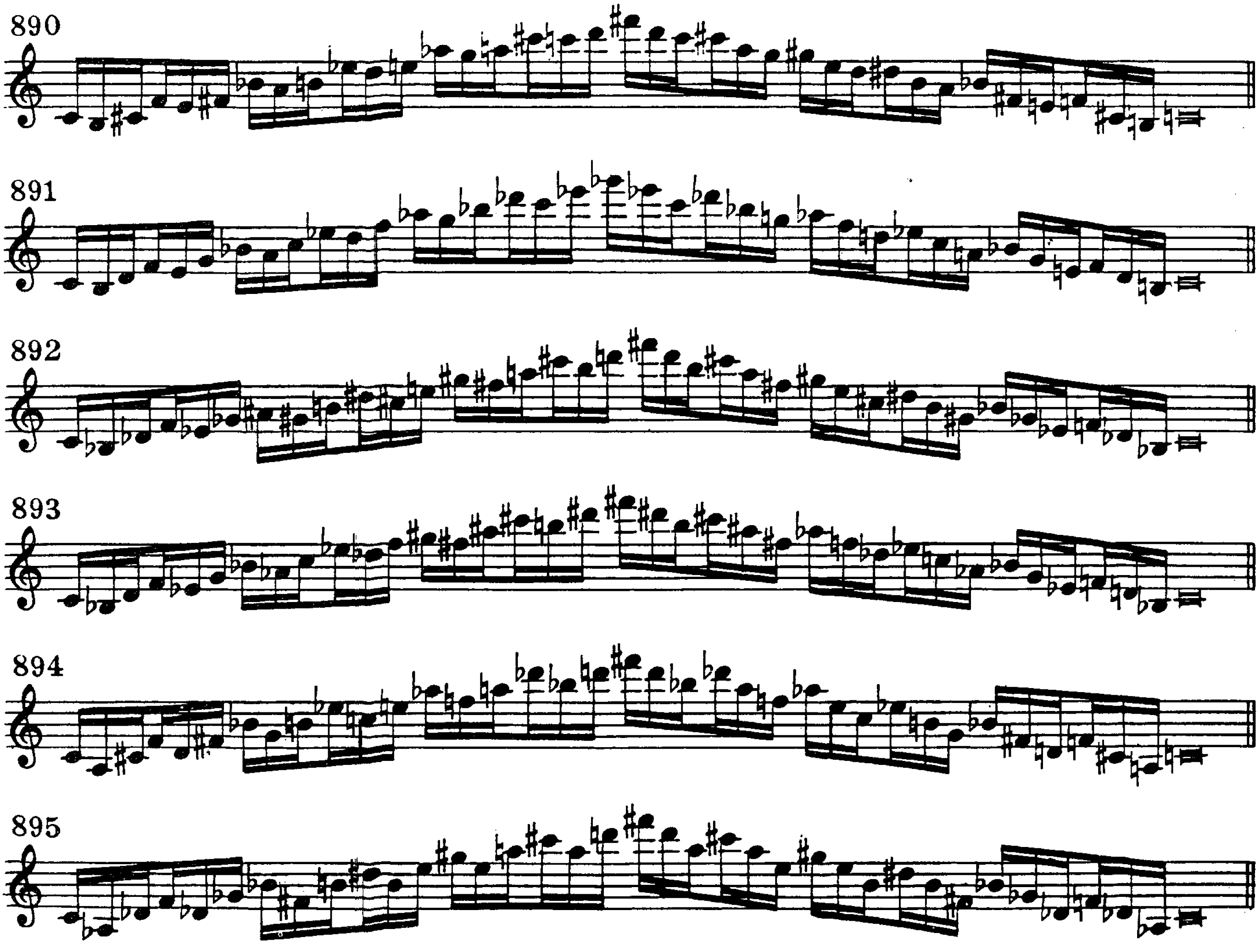





## Infrapolation of Three Notes
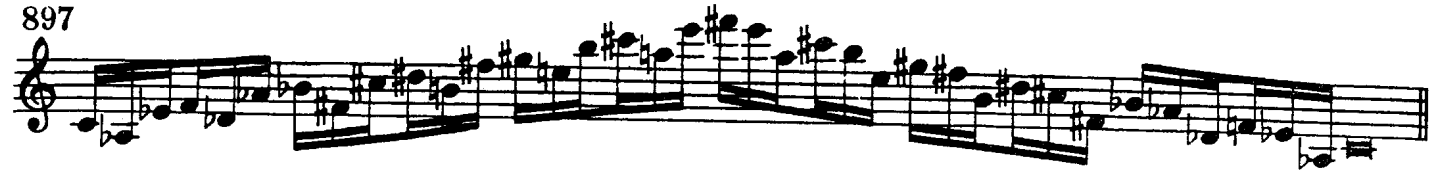





## Infra-Interpolation
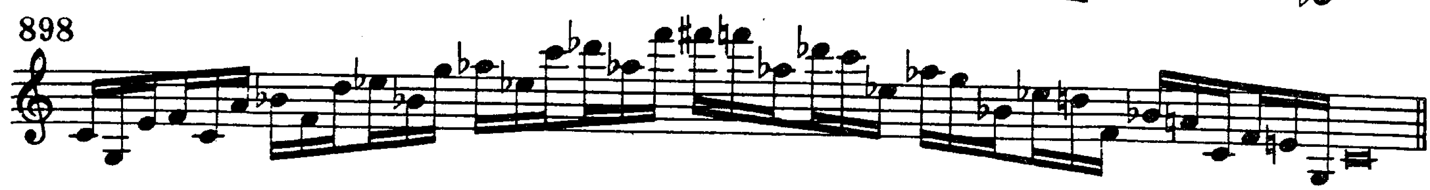


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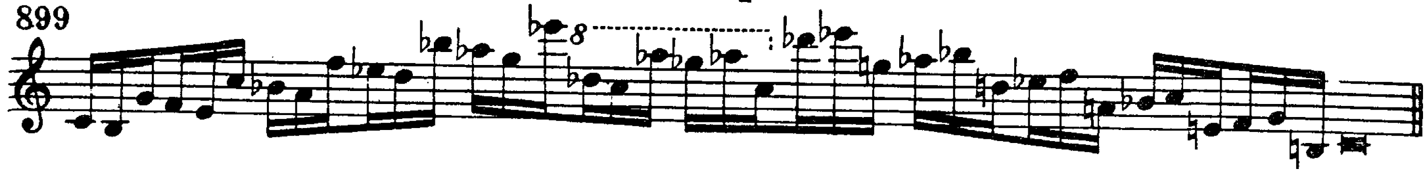


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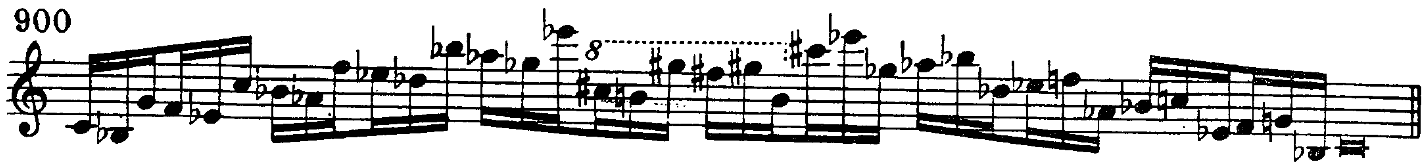


## Infra-Ultrapolation
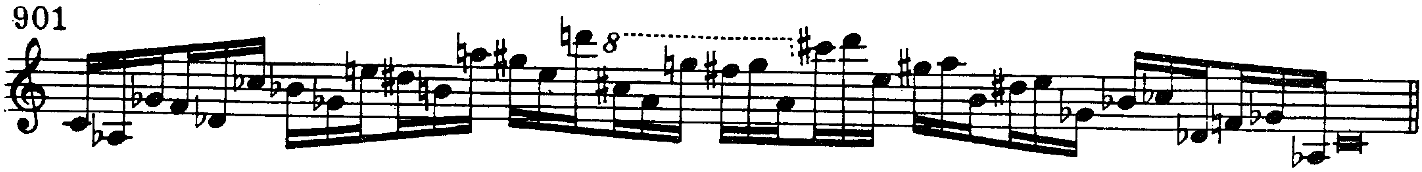
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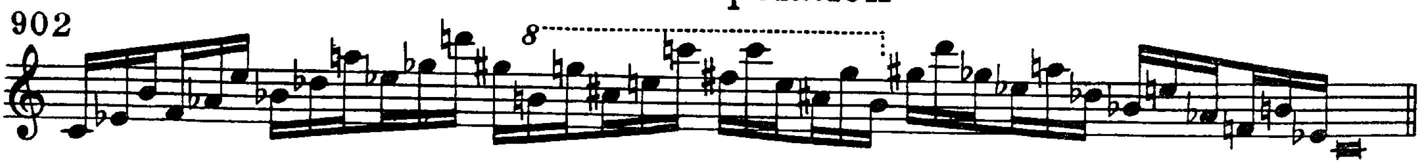


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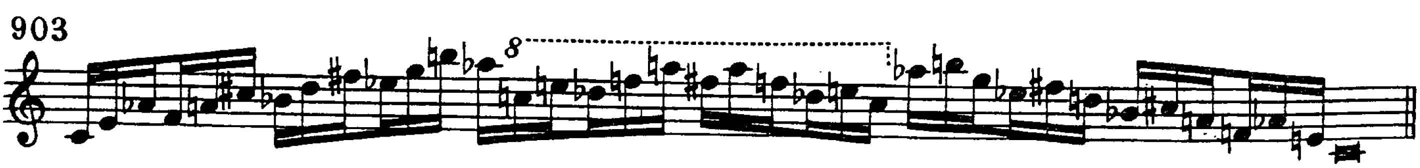


## Inter-Ultrapolation

902

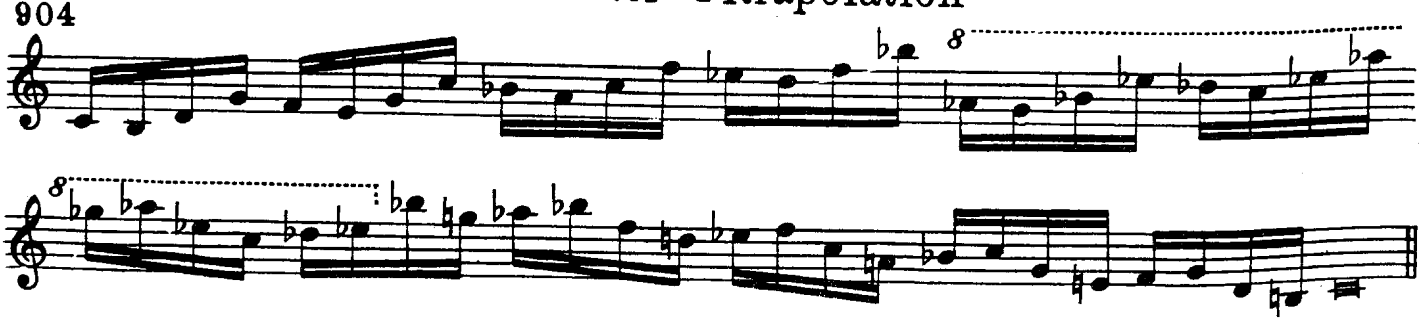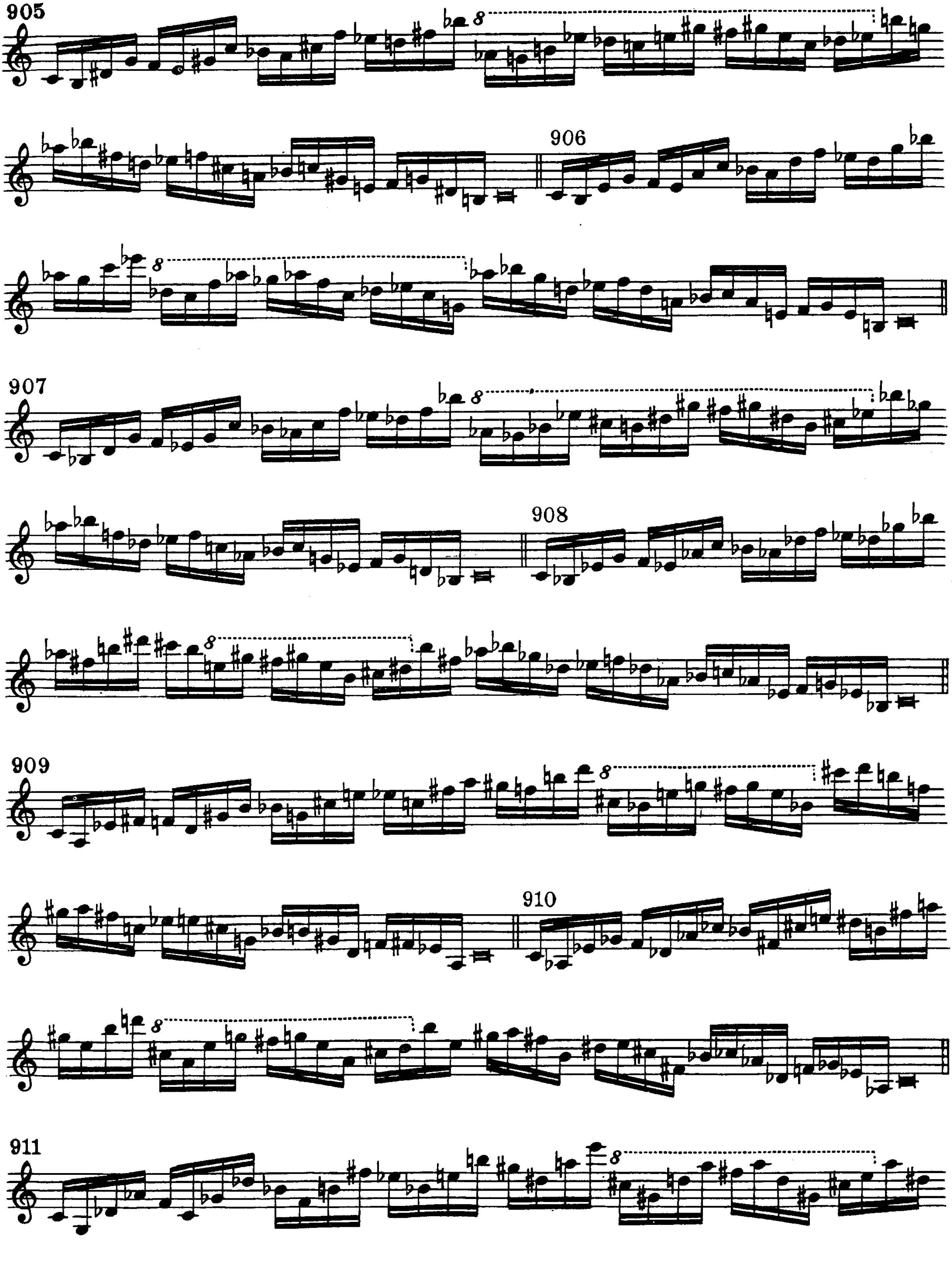


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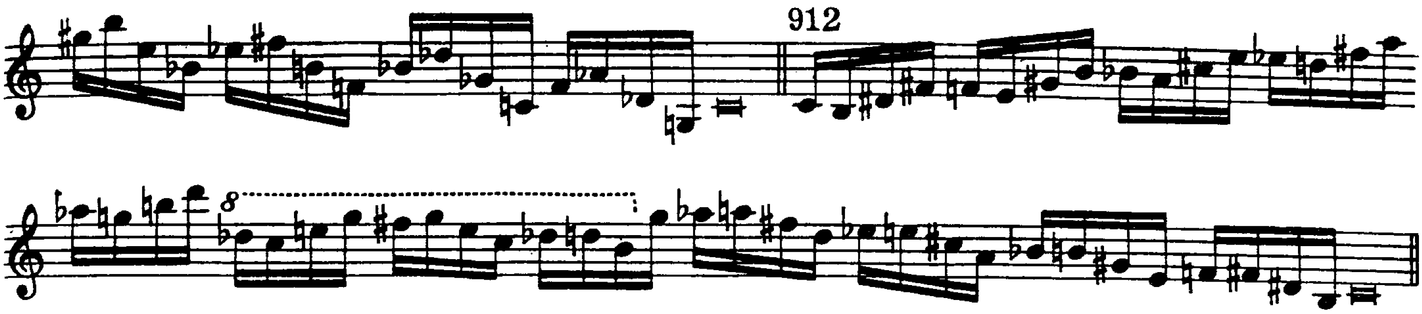


## Infra-Inter-Ultrapolation

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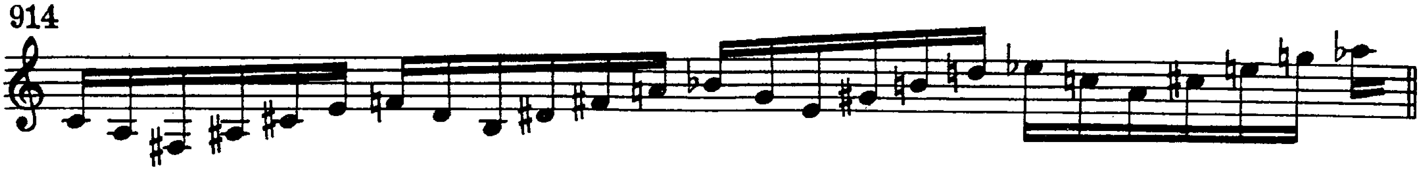



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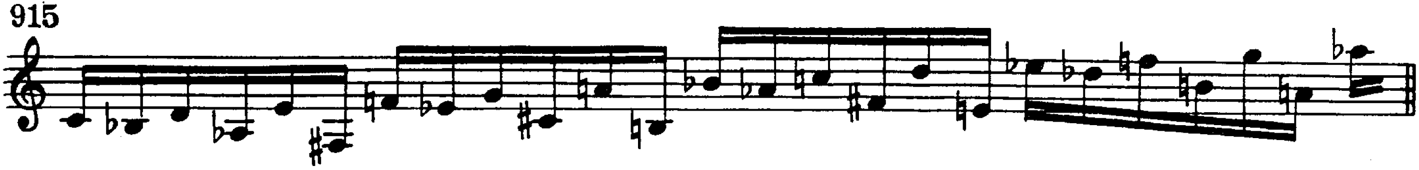
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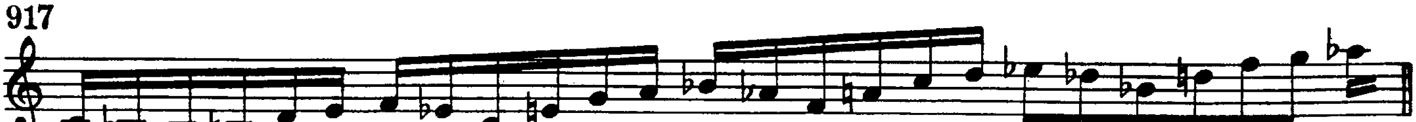


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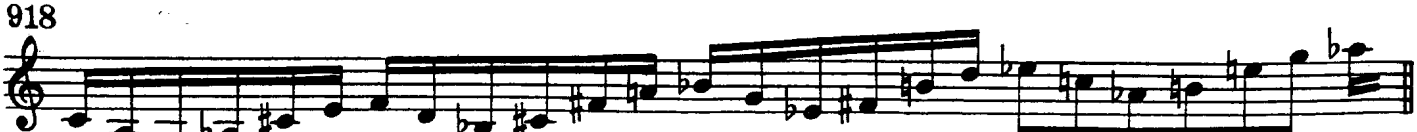


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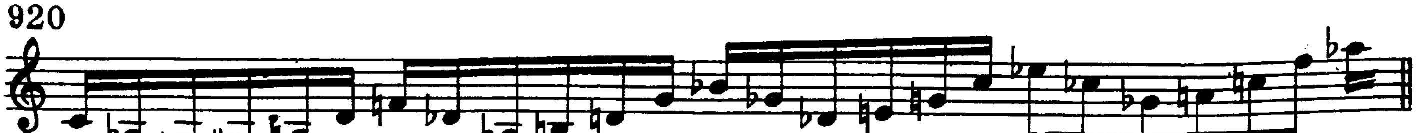


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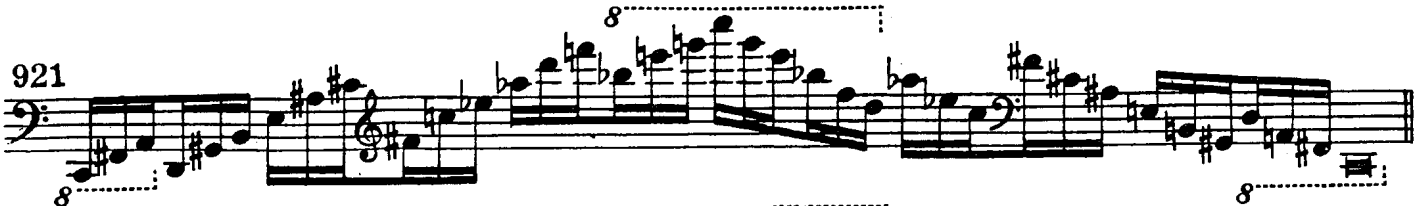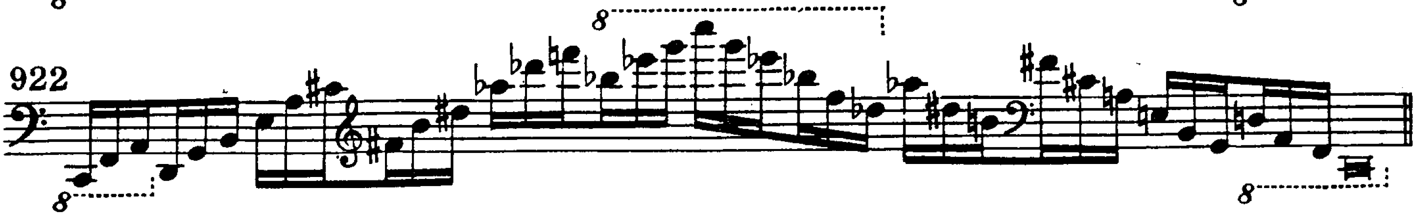


# Septitone Progression

## Equal Division of Seven Octaves into Six Parts



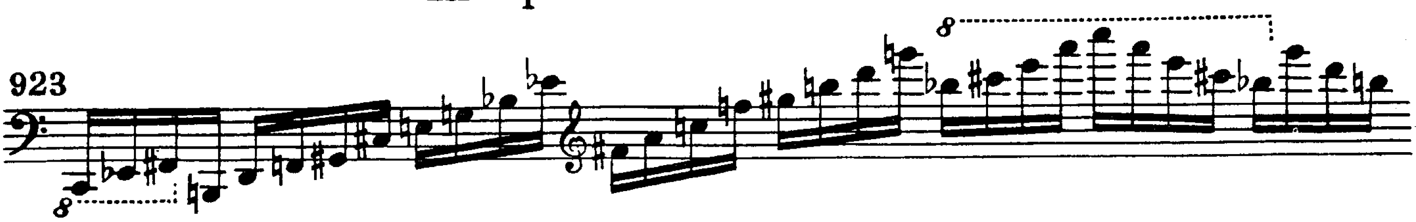

### Interpolation of Two Notes
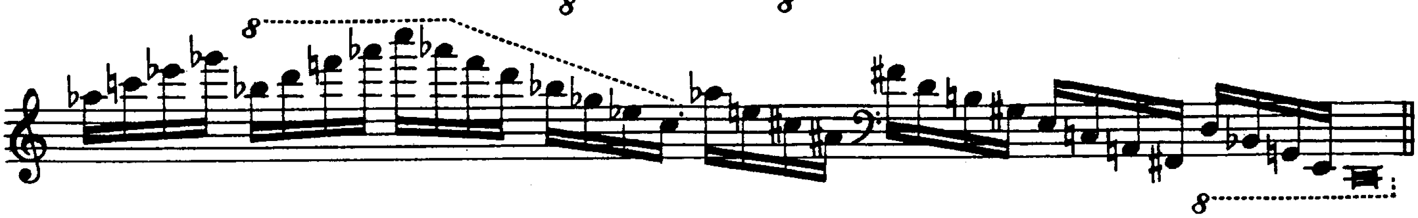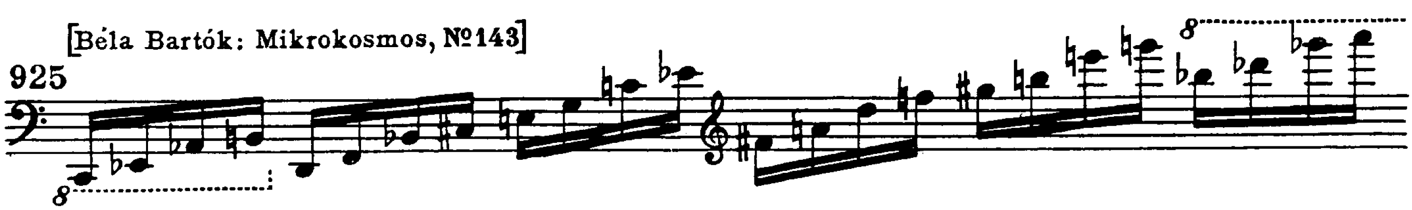
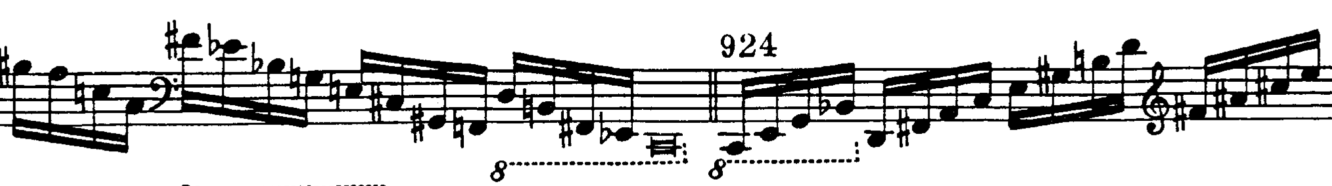






### Interpolation of Three Notes
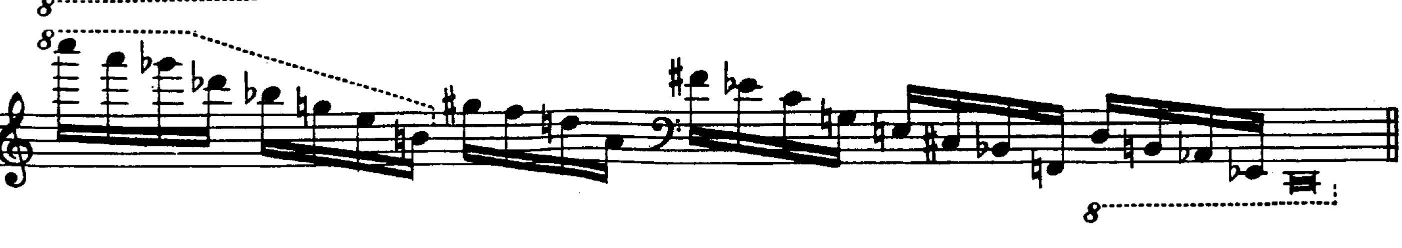






[Béla Bartók: Mikrokosmos, №143]





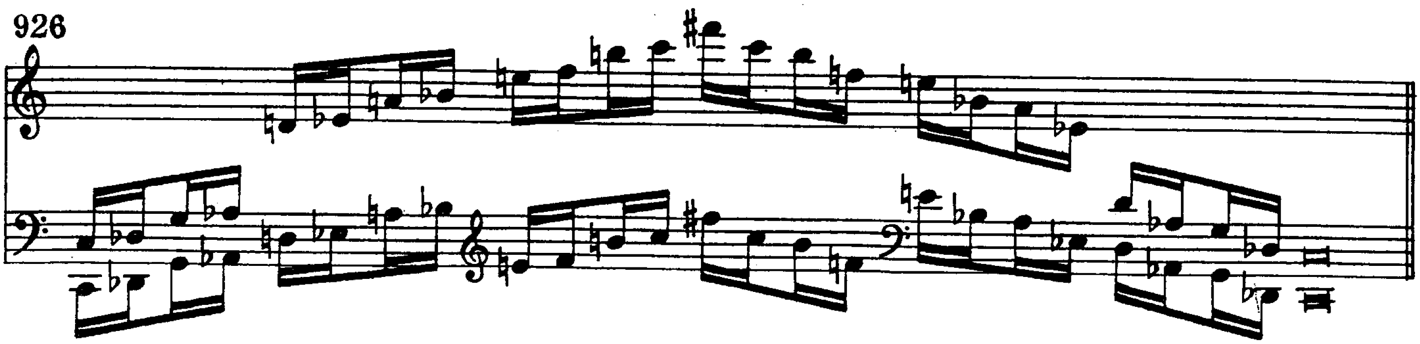

# Diapente Progression

## Equal Division of Seven Octaves into Twelve Parts

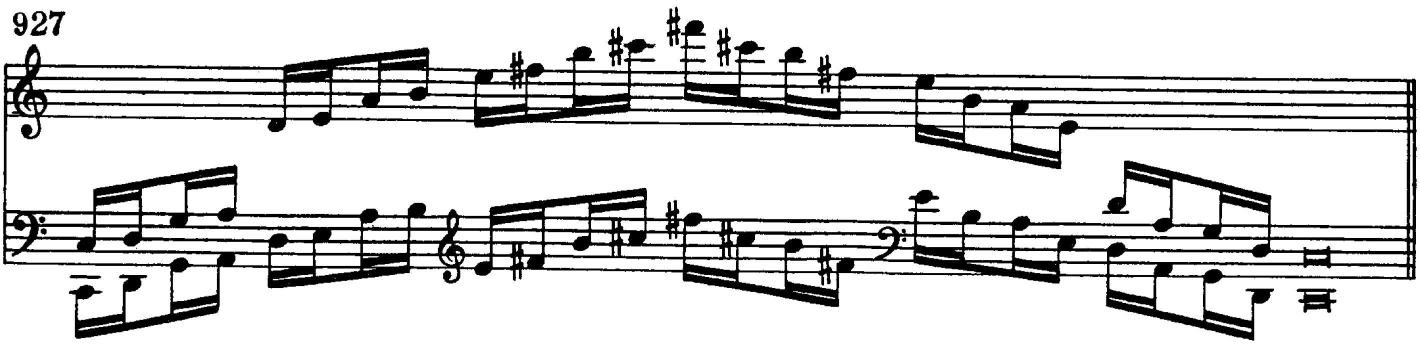


### Interpolation of One Note

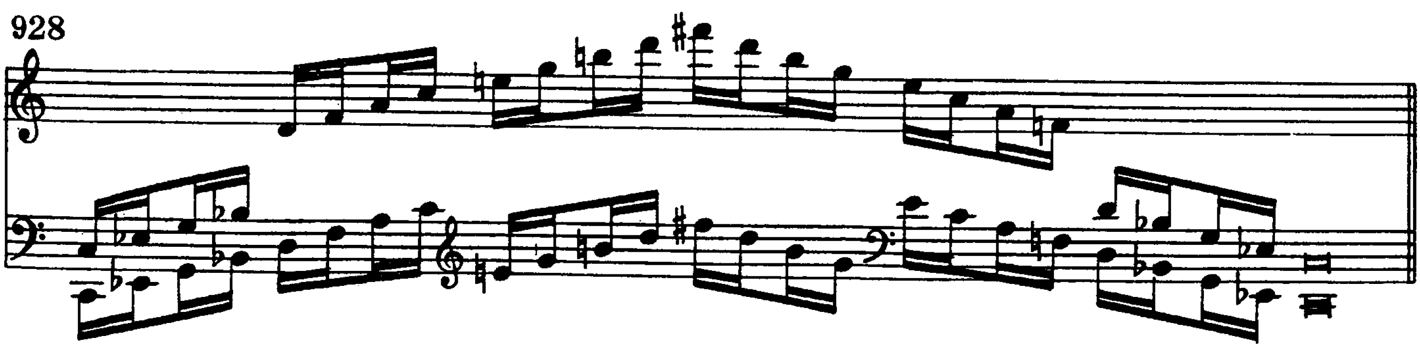
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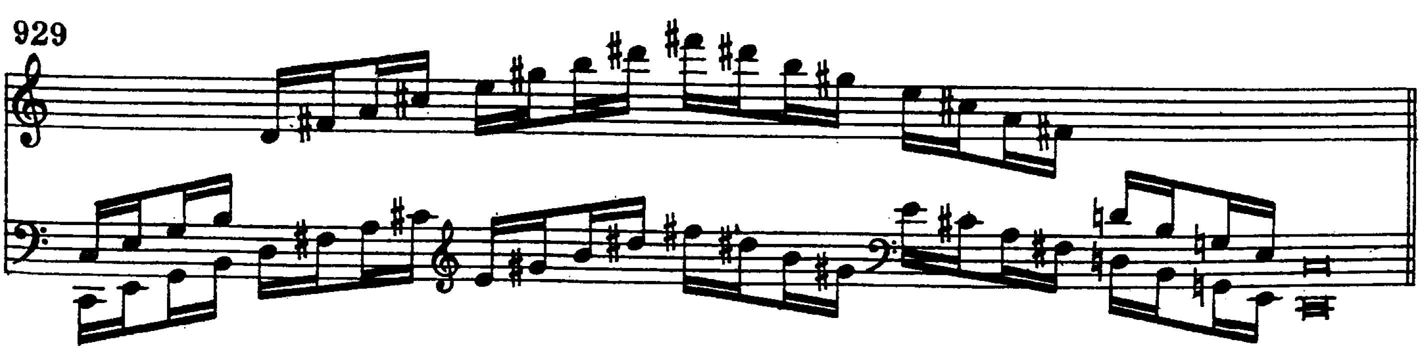
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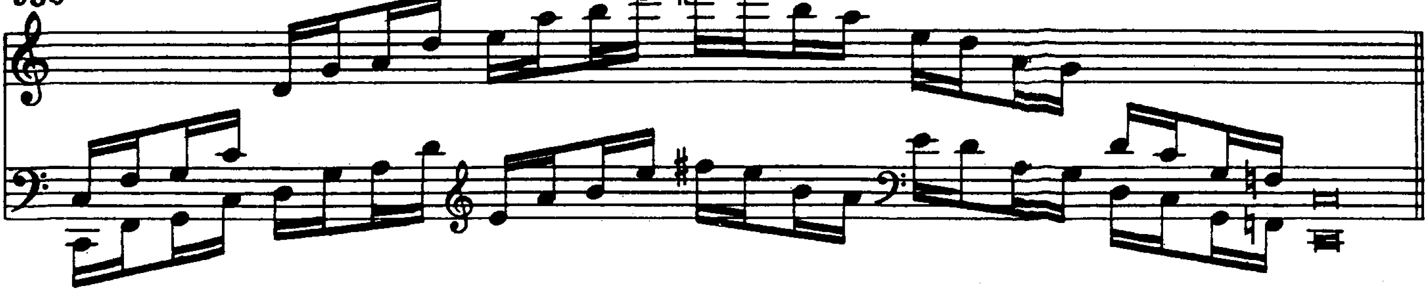


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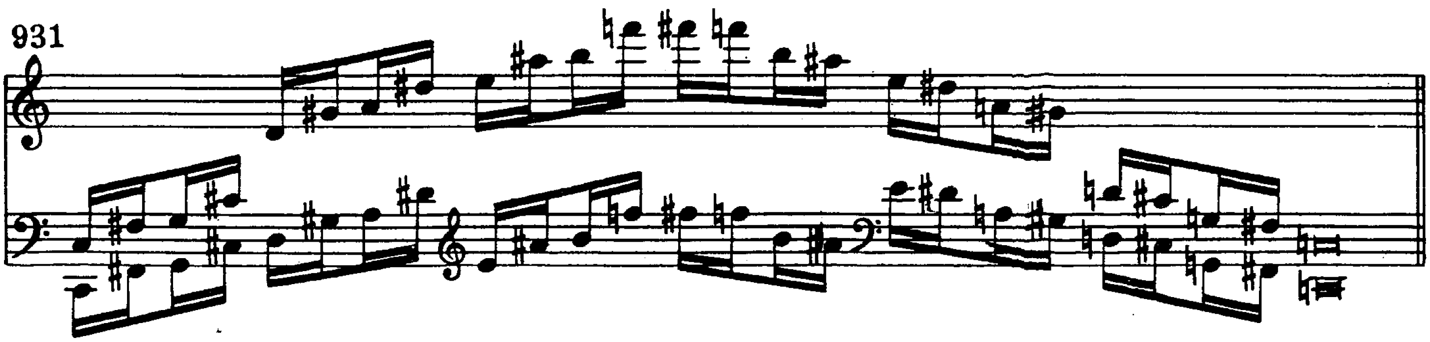
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930

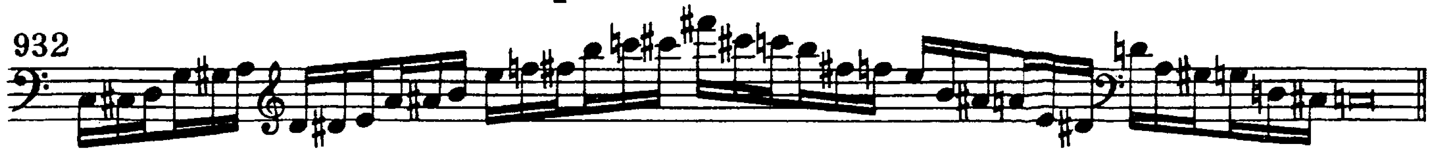


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## Interpolation of Two Notes

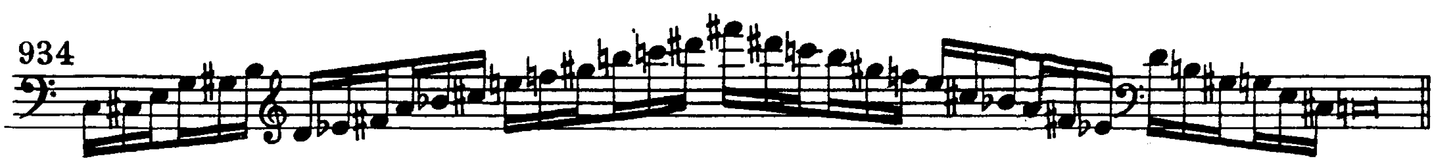
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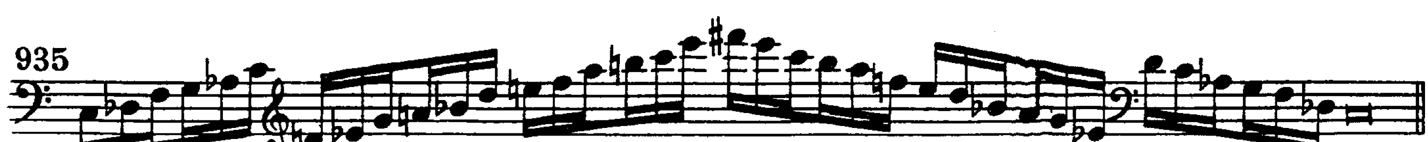
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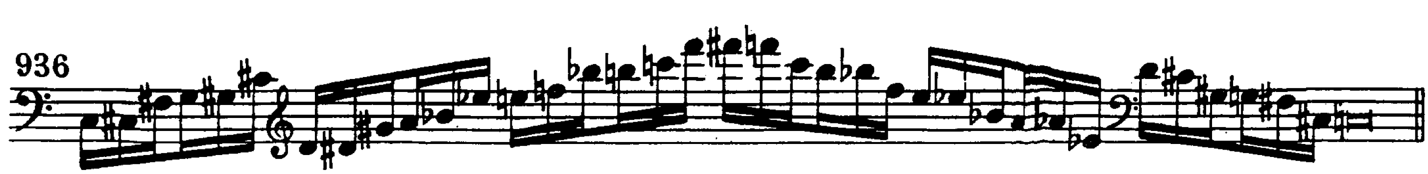
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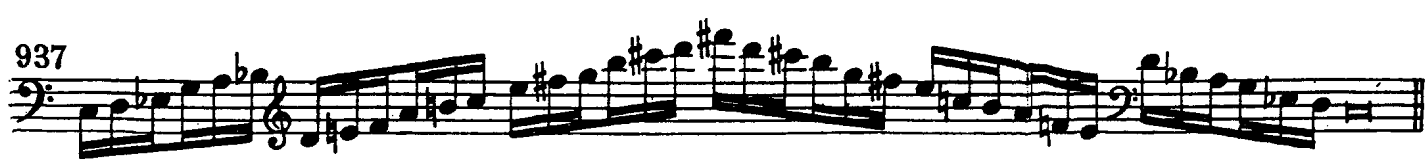
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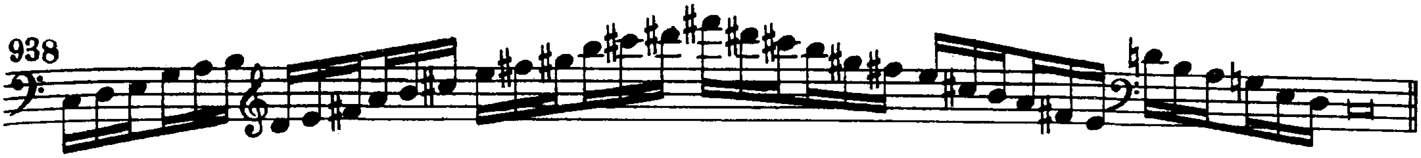


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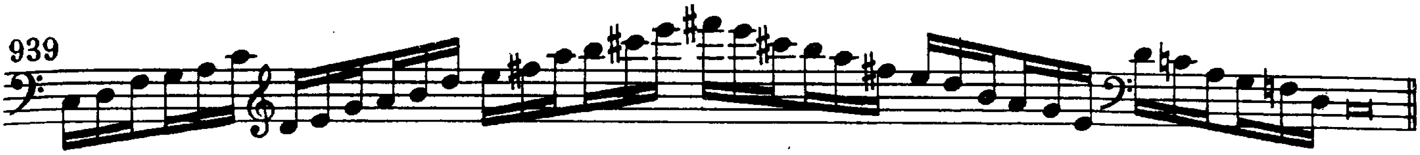
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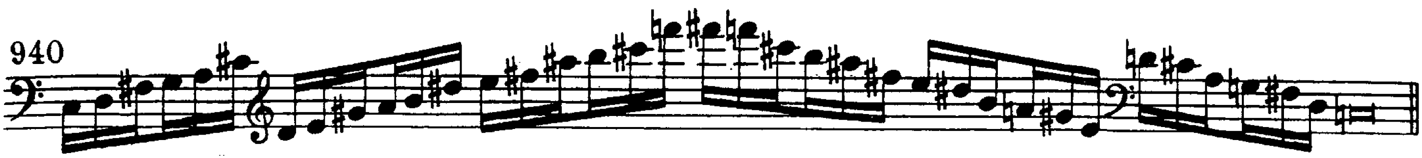
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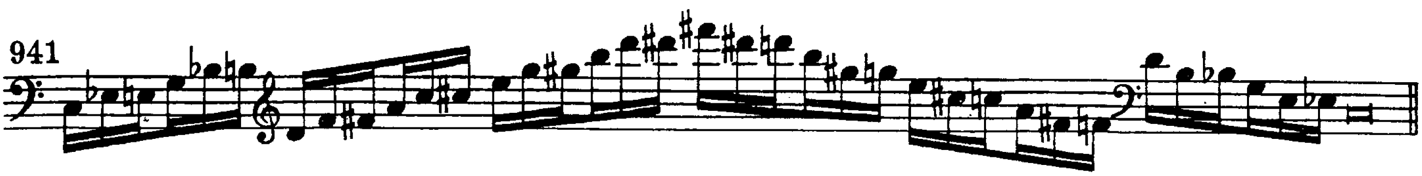
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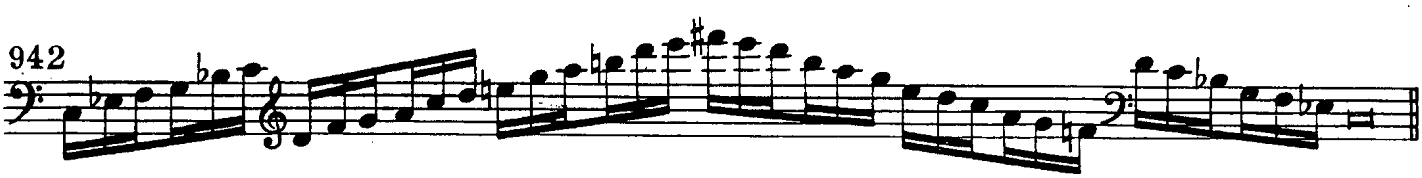
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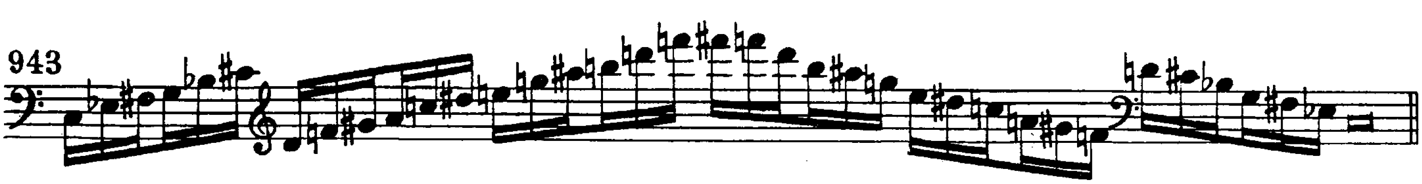
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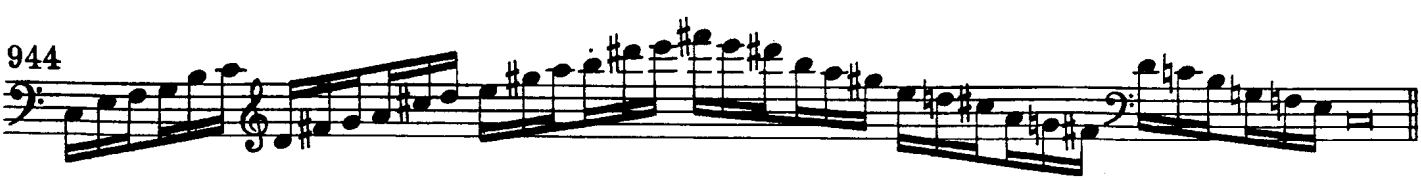
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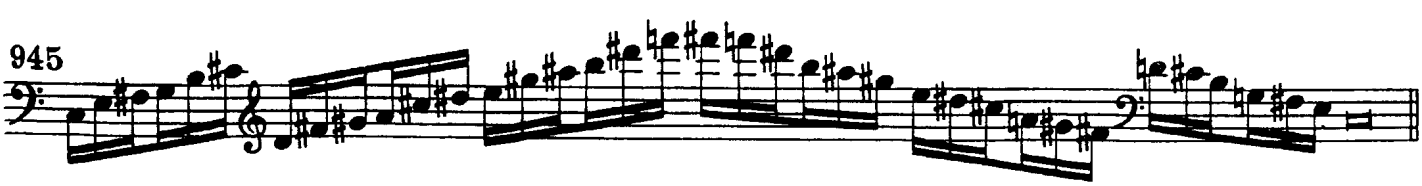
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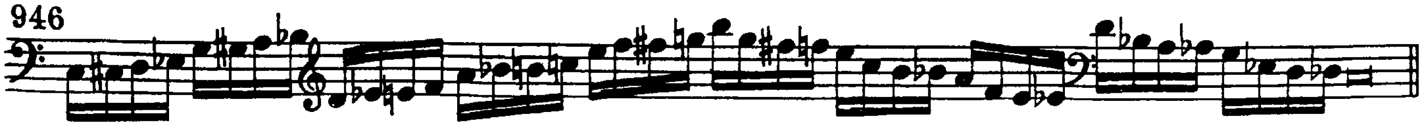


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## Interpolation of Three Notes

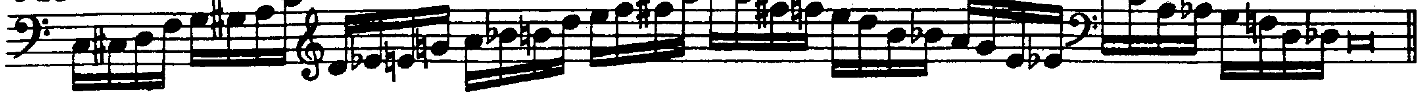
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947



948



949



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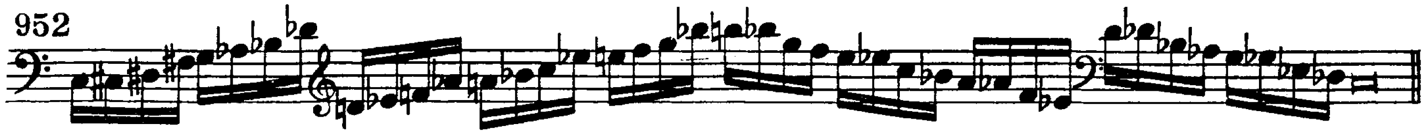


Disjunct Phrygian Polytetrachord

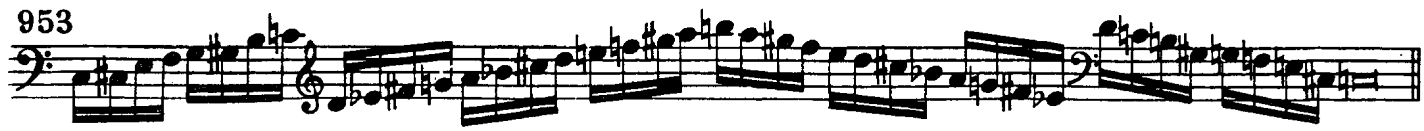
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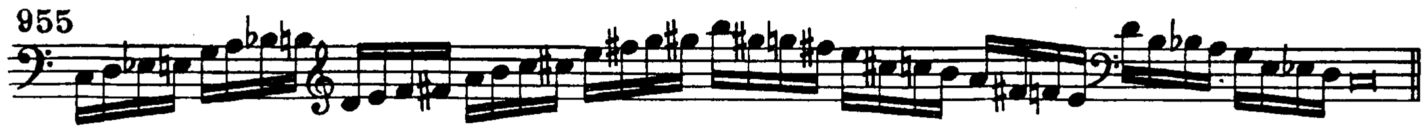
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Disjunct Minor Polytetrachord

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957



Disjunct Major Polytetrachord

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Disjunct Lydian Polytetrachord
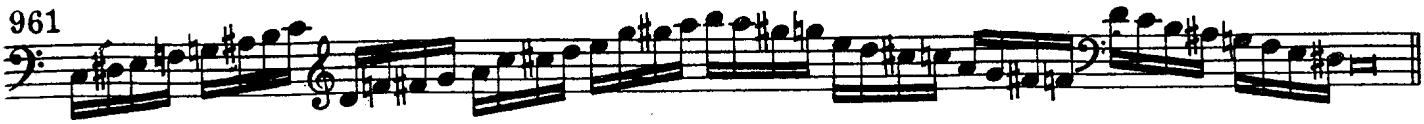
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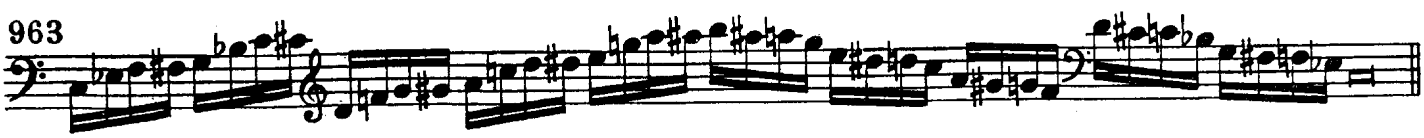


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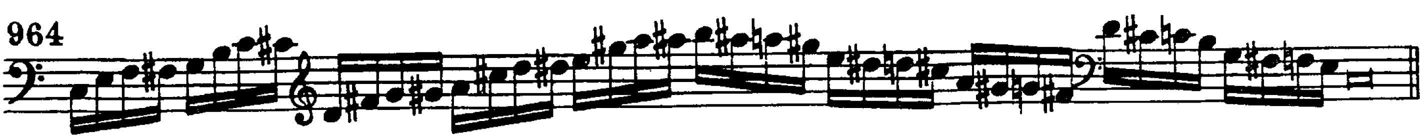


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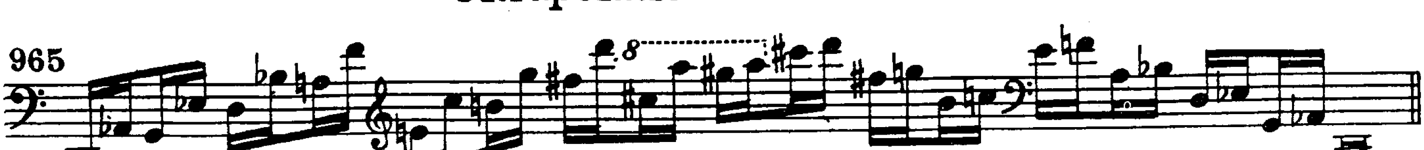


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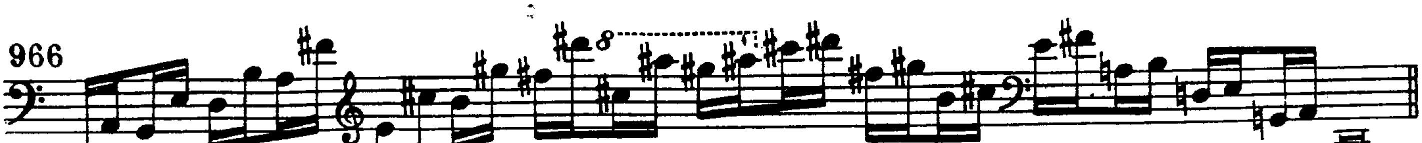


## Ultrapolation of One Note

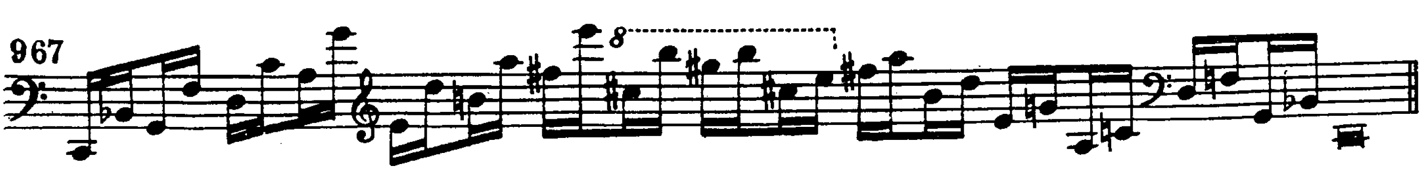
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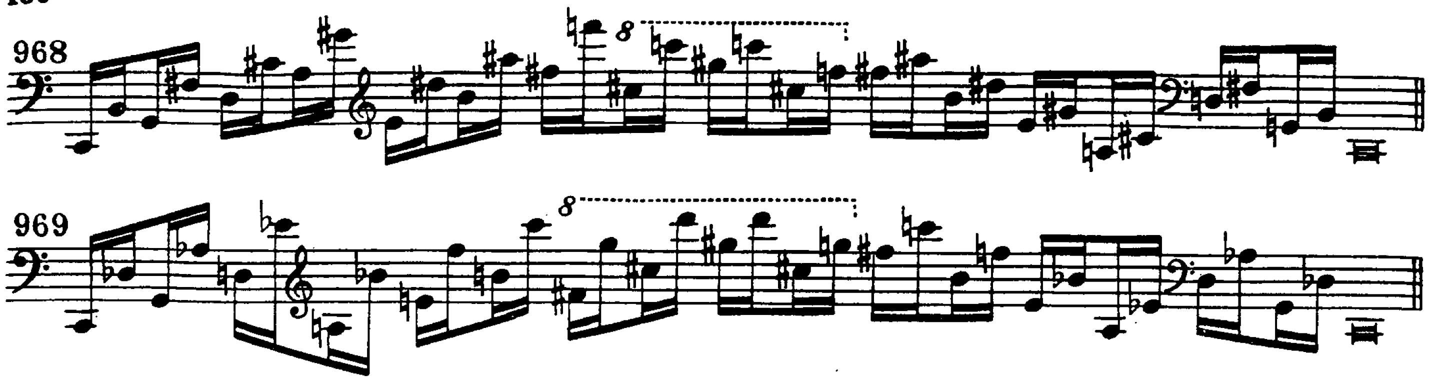



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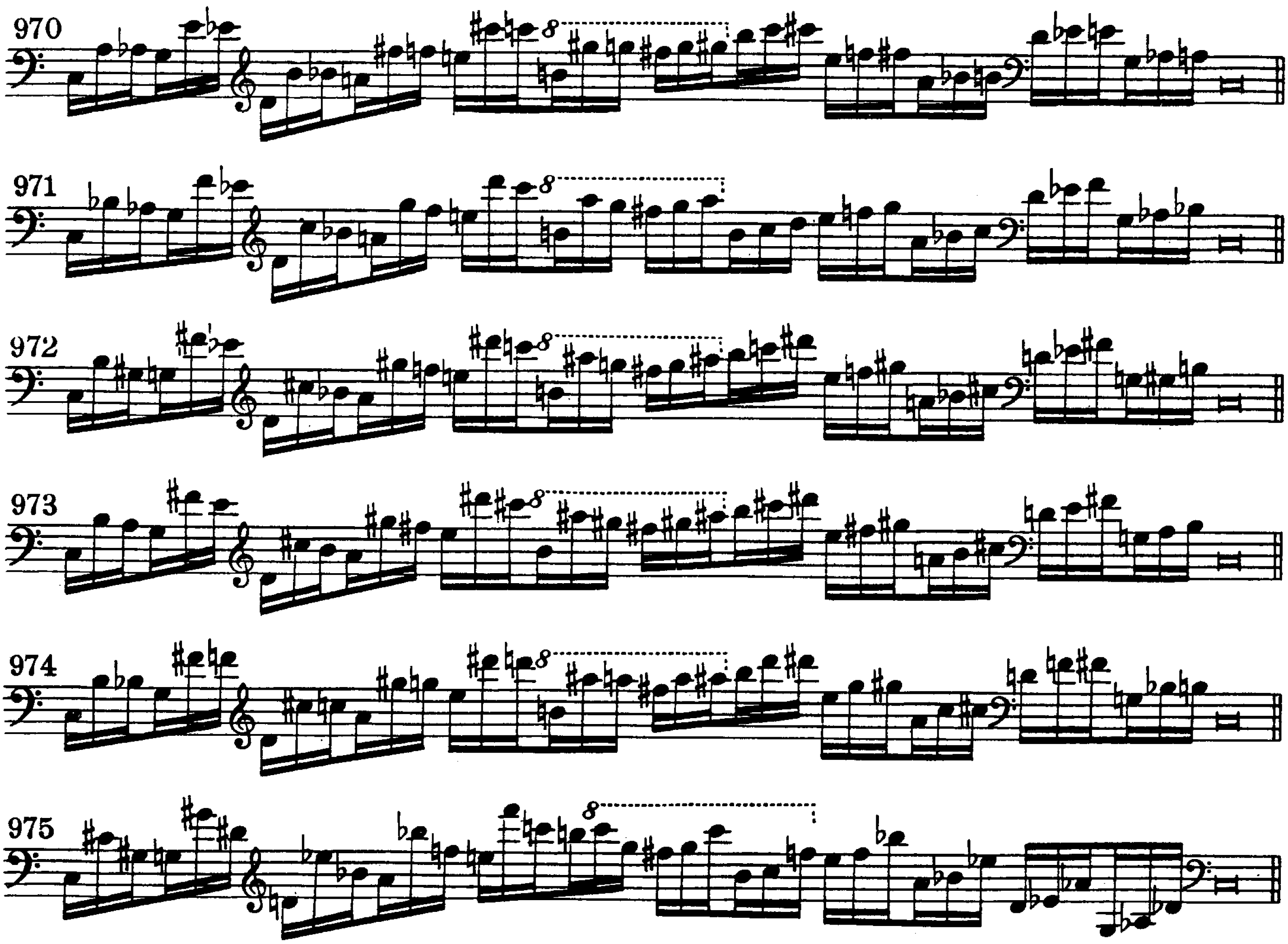



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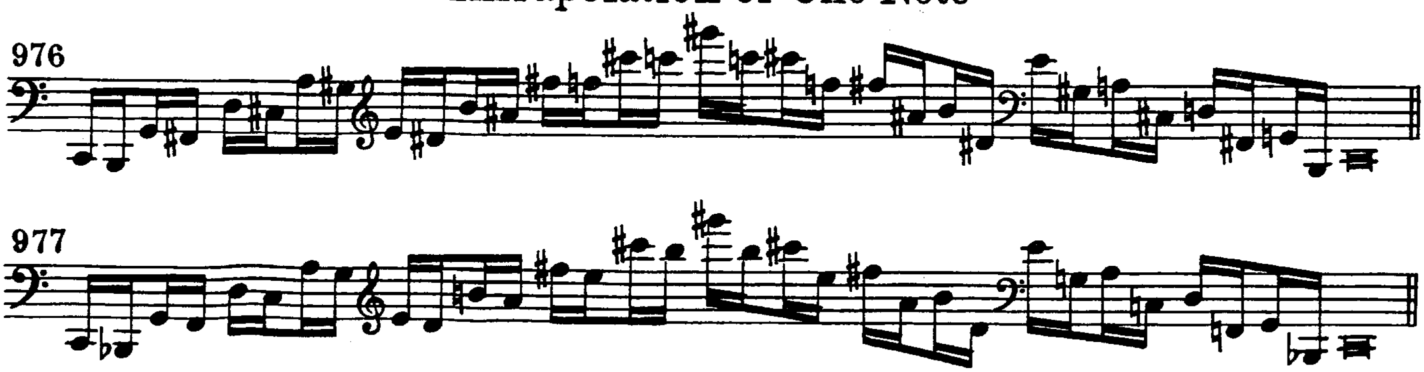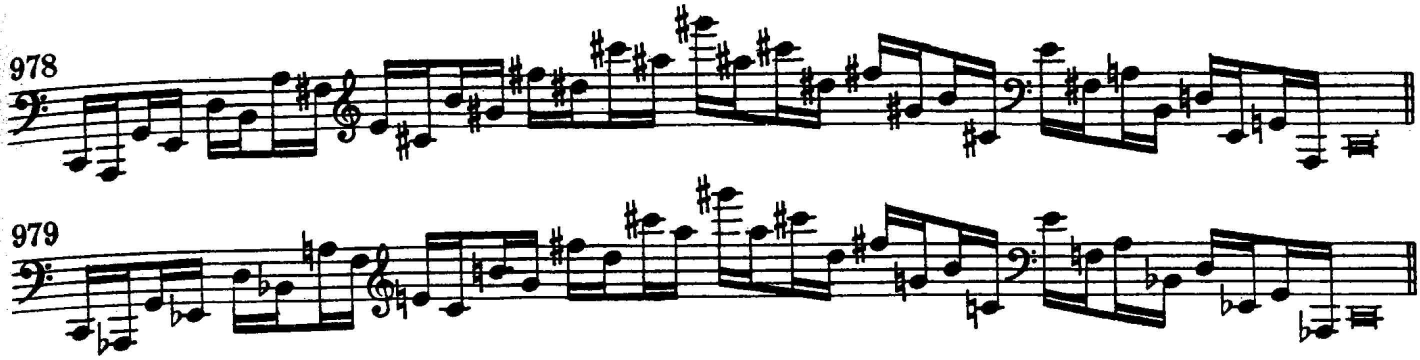





## Ultrapolation of Two Notes
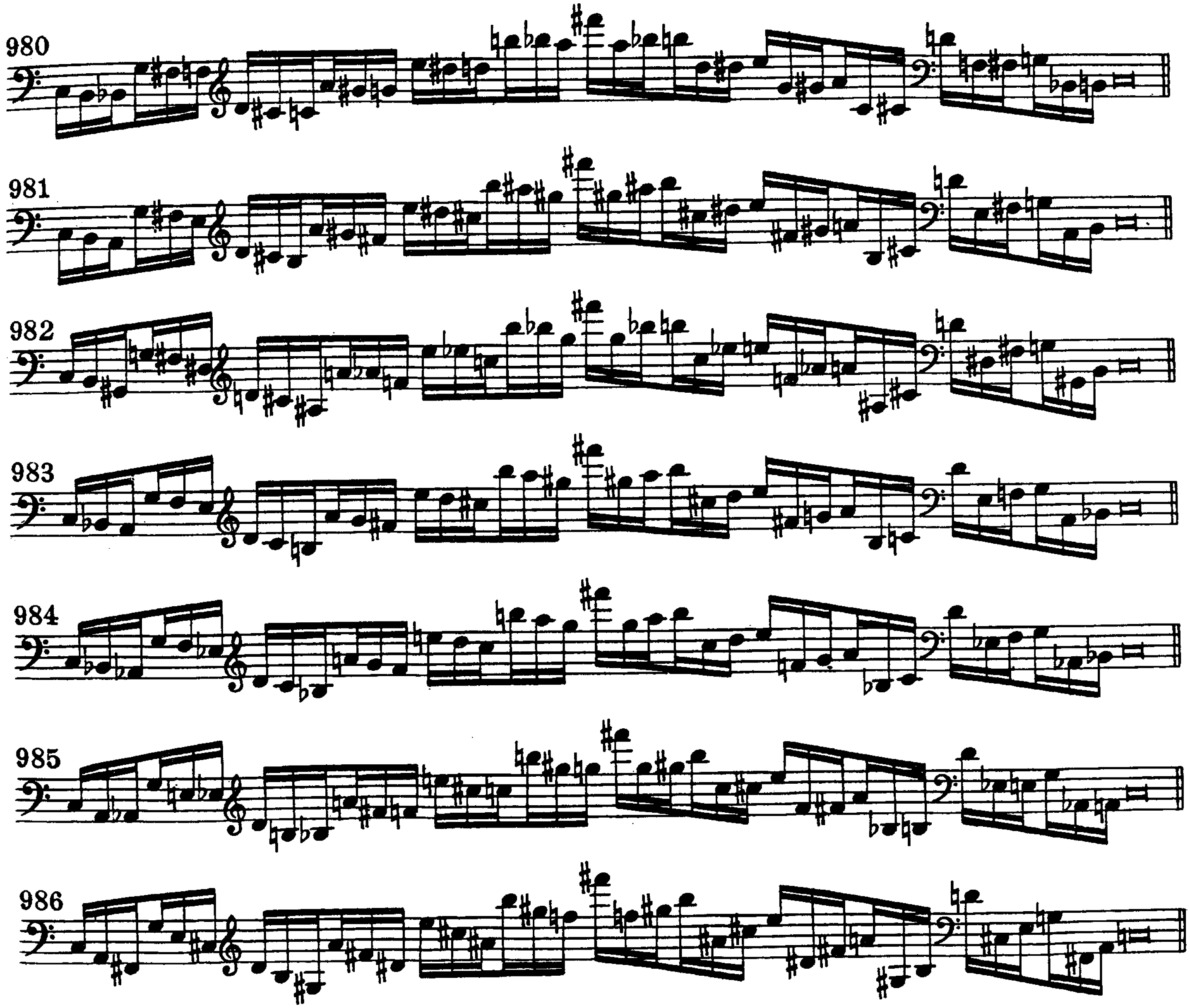



## Infrapolation of One Note

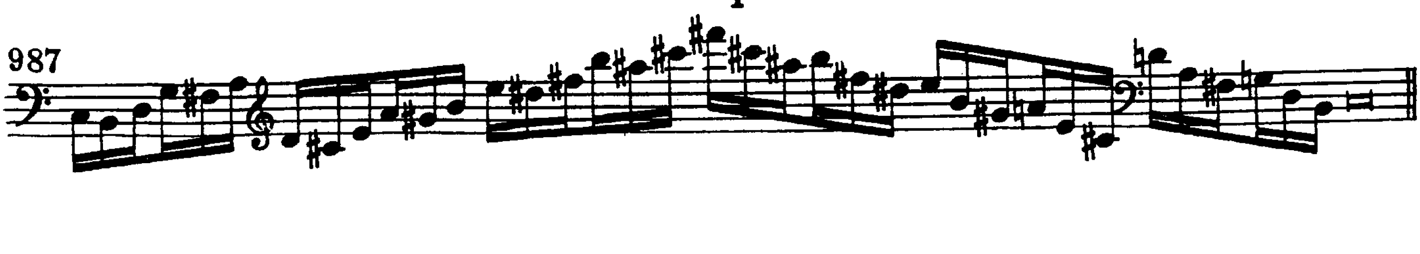


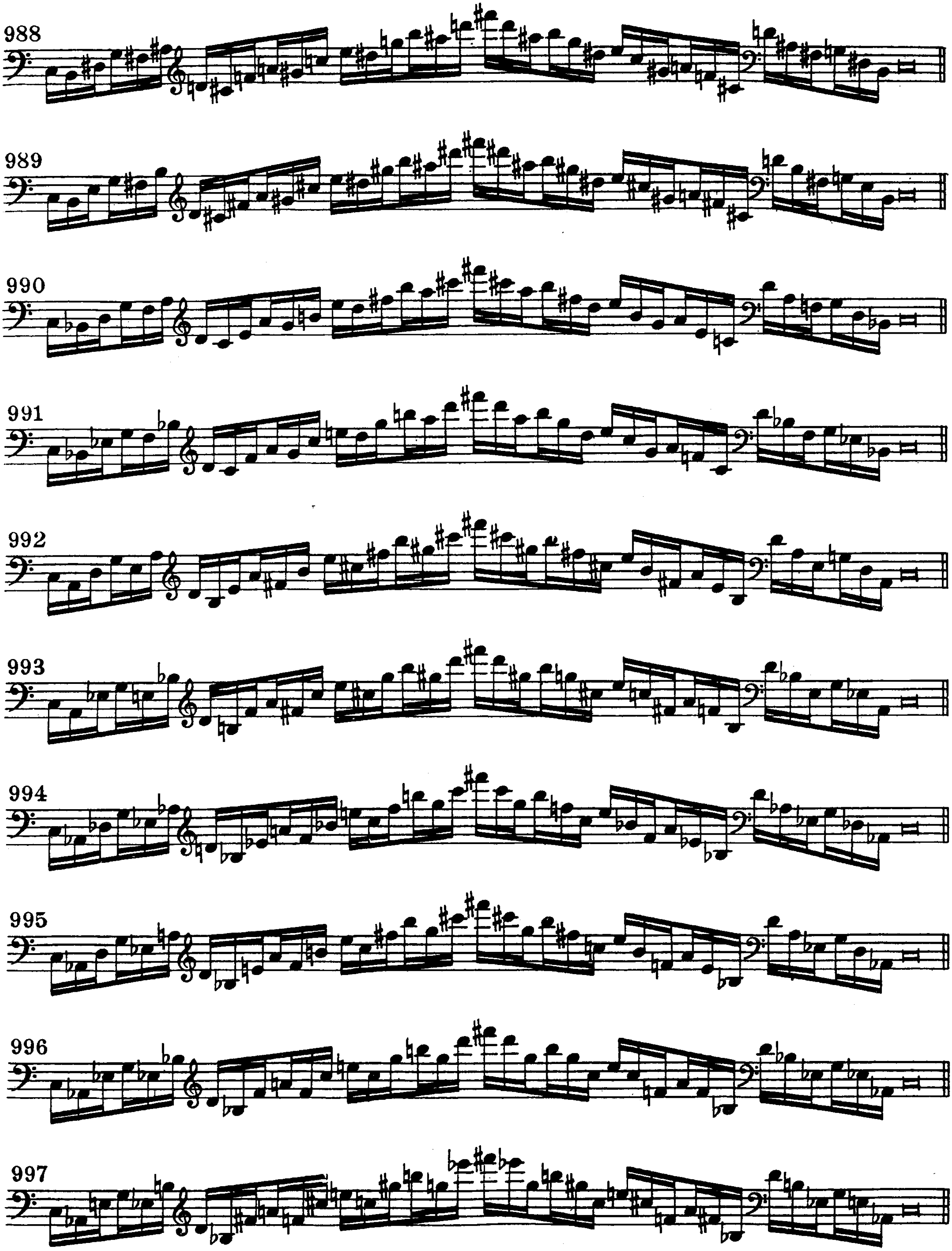


## Infrapolation of Two Notes
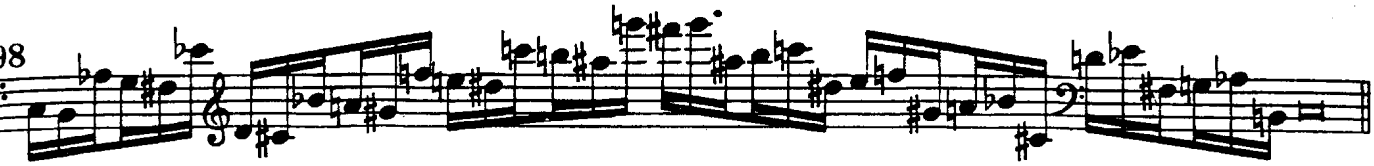


## Infra-Interpolation
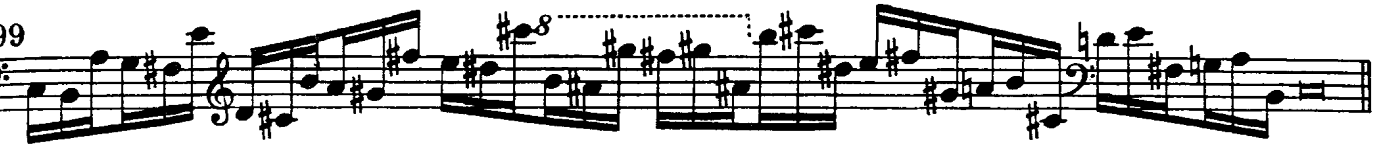



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# Infra-Ultrapolation
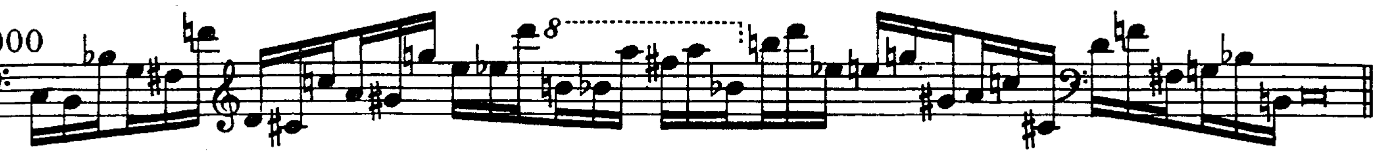
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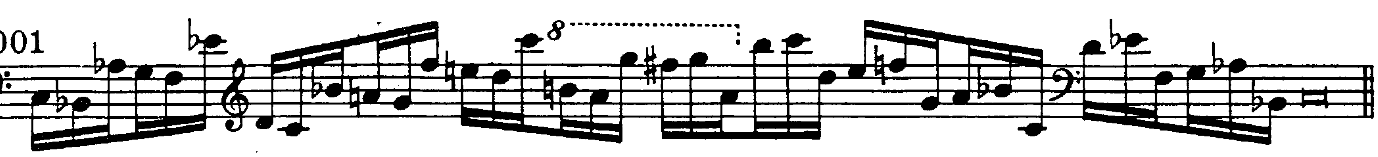


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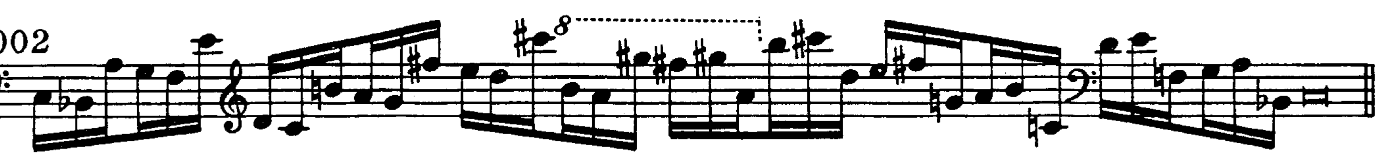
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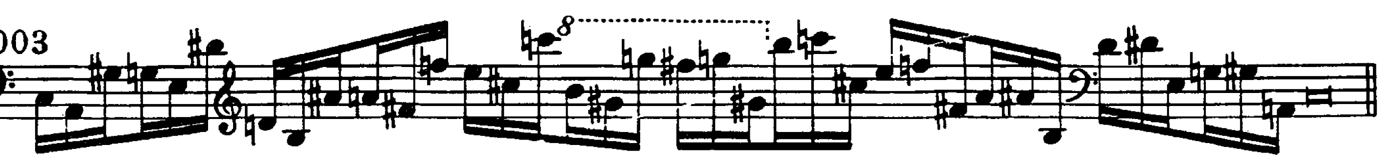


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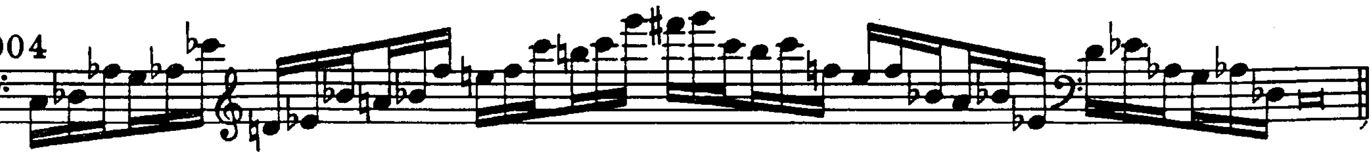


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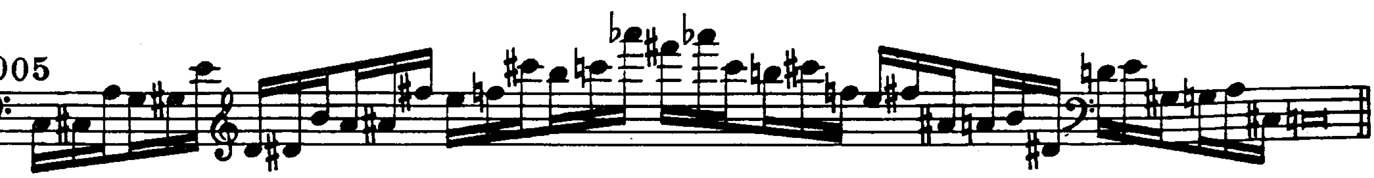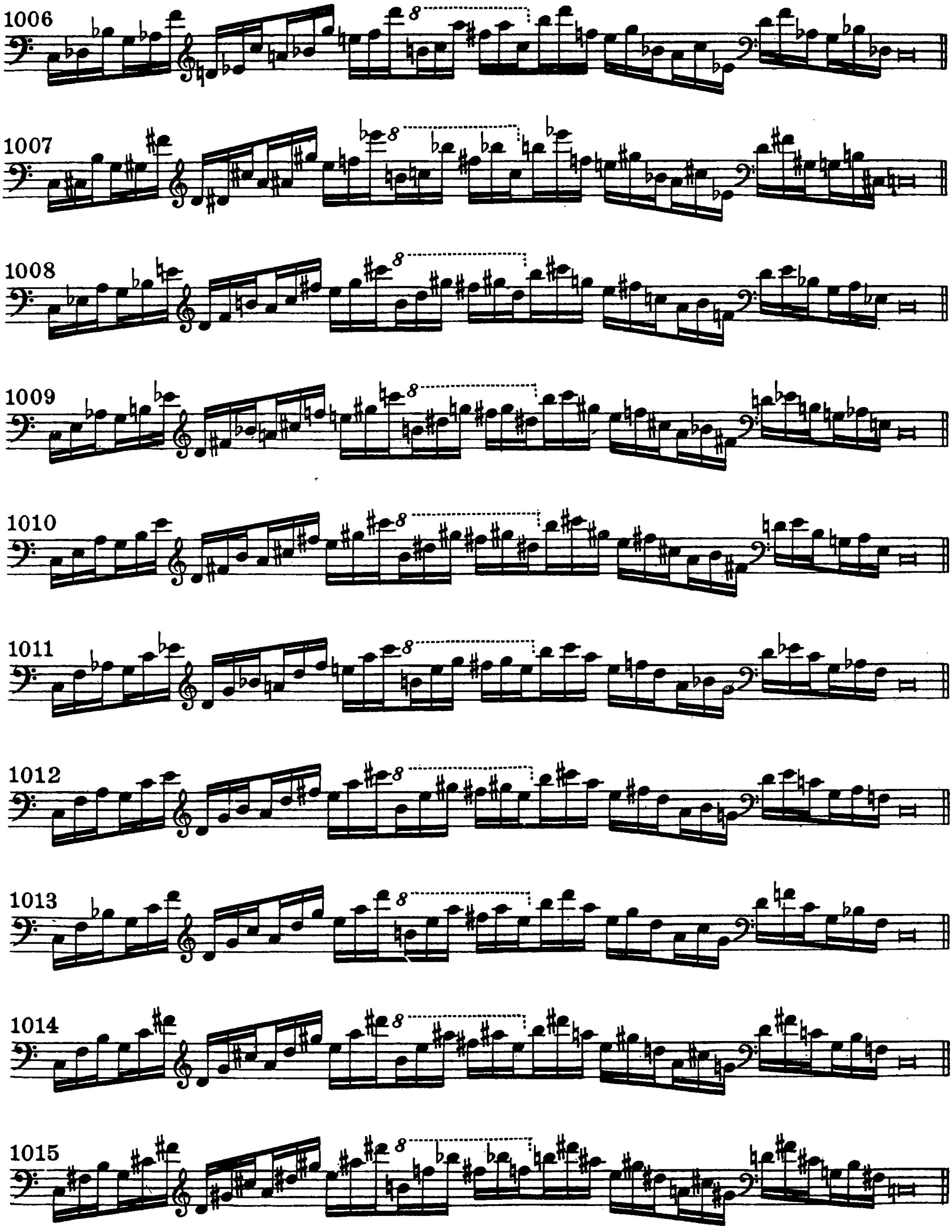


# Inter-Ultrapolation

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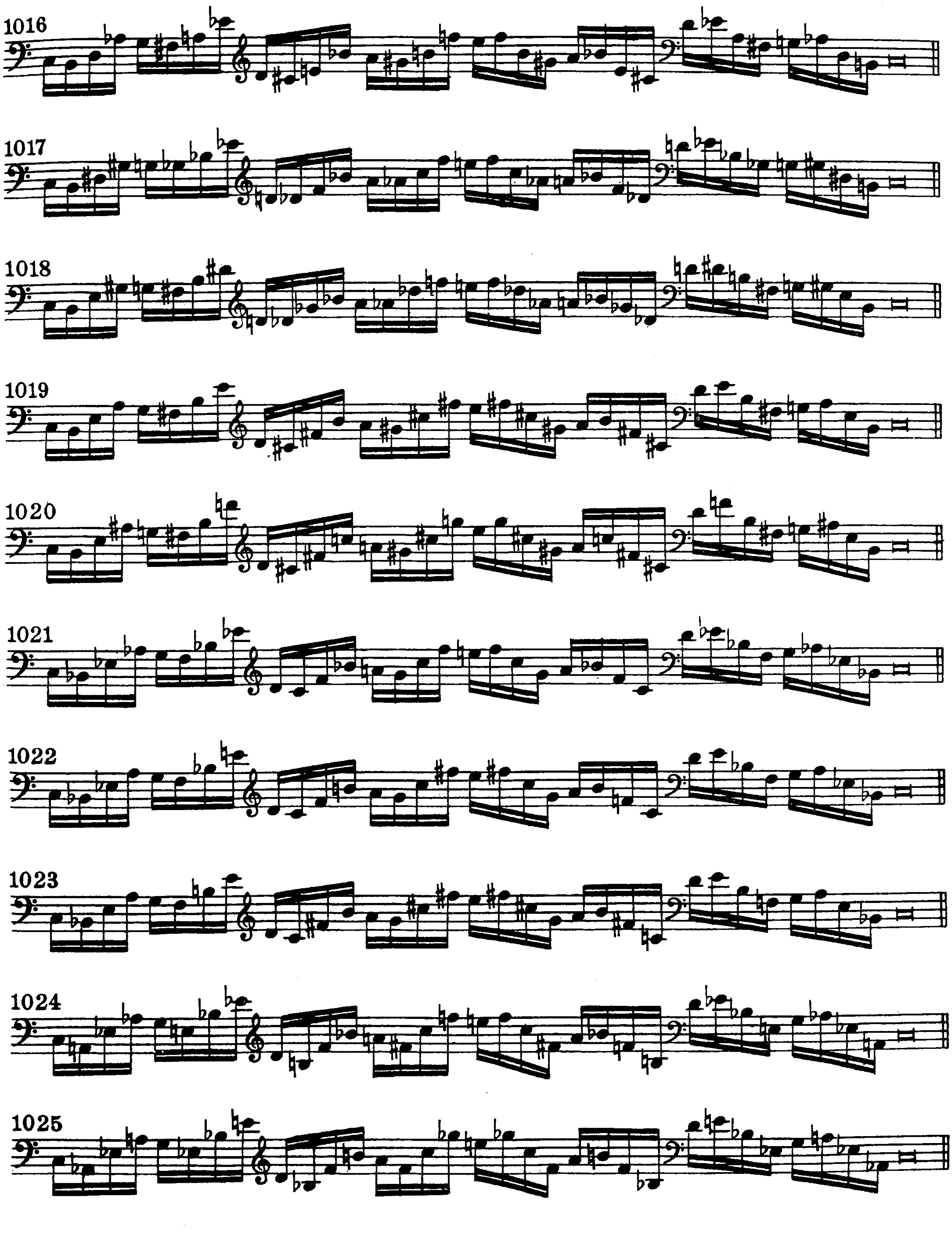


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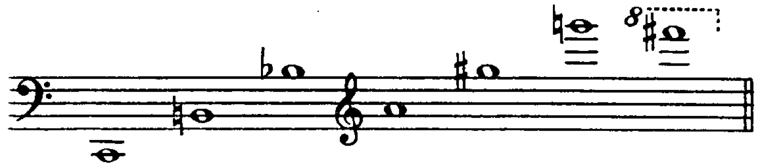



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# Infra-Inter-Ultrapolation



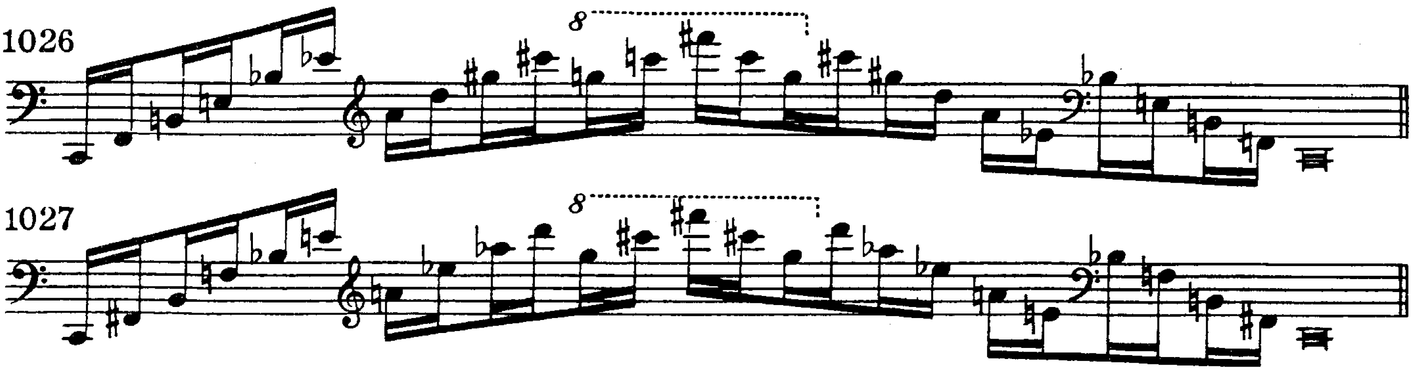
# Sesquiquinquetone Progression

## Equal Division of Eleven Octaves into Twelve Parts



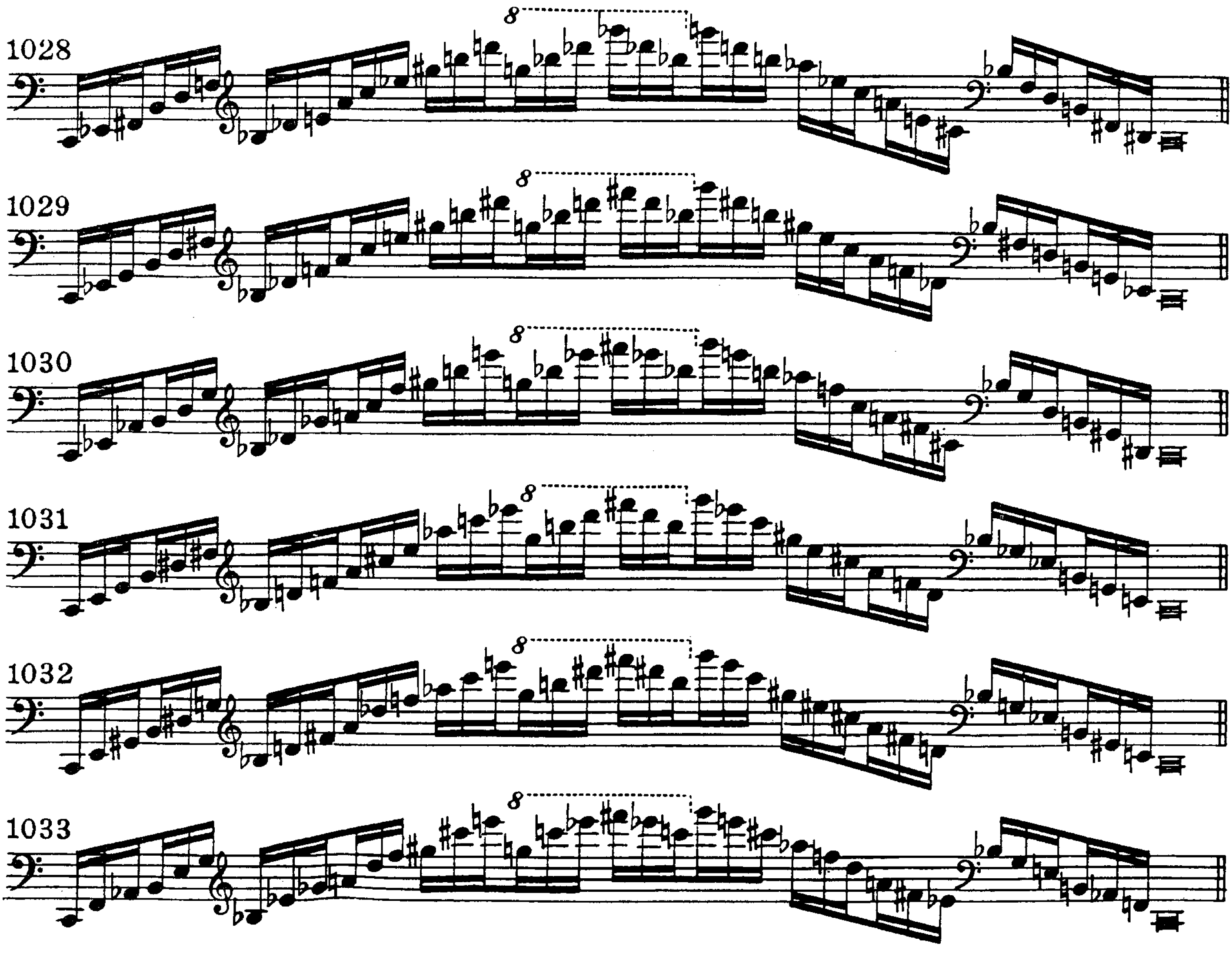
### Interpolation of One Note

1026
1027
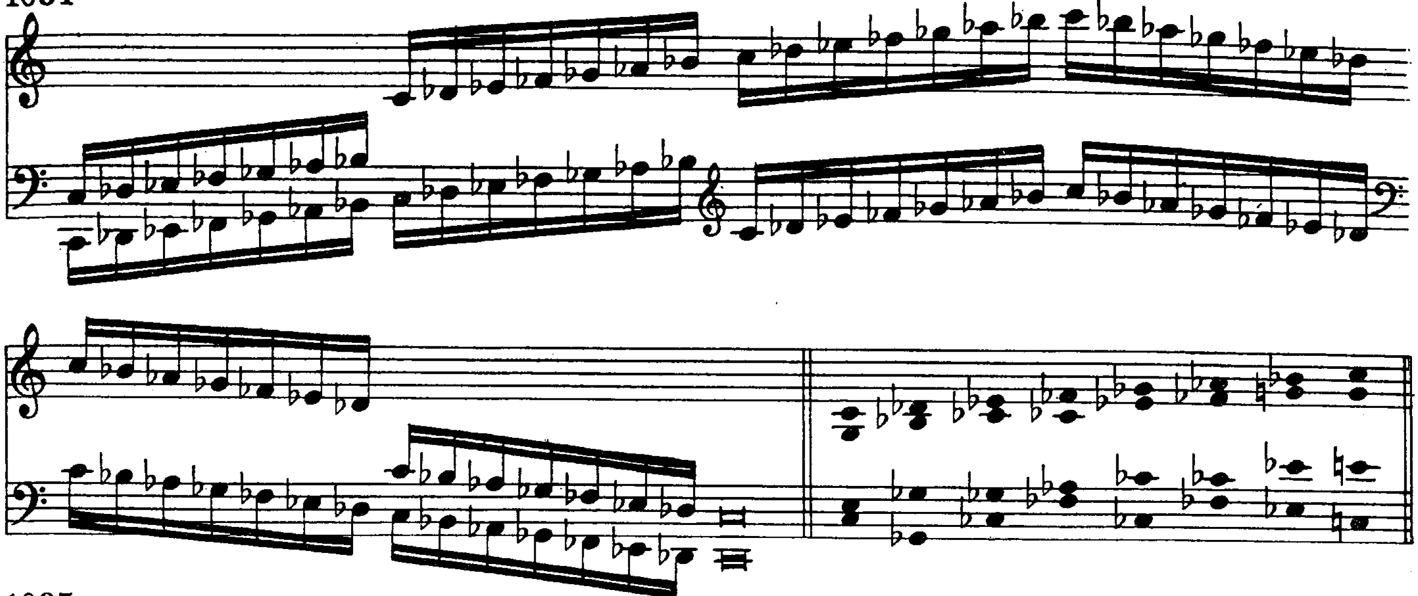


### Interpolation of Two Notes

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1030
1031
1032
1033
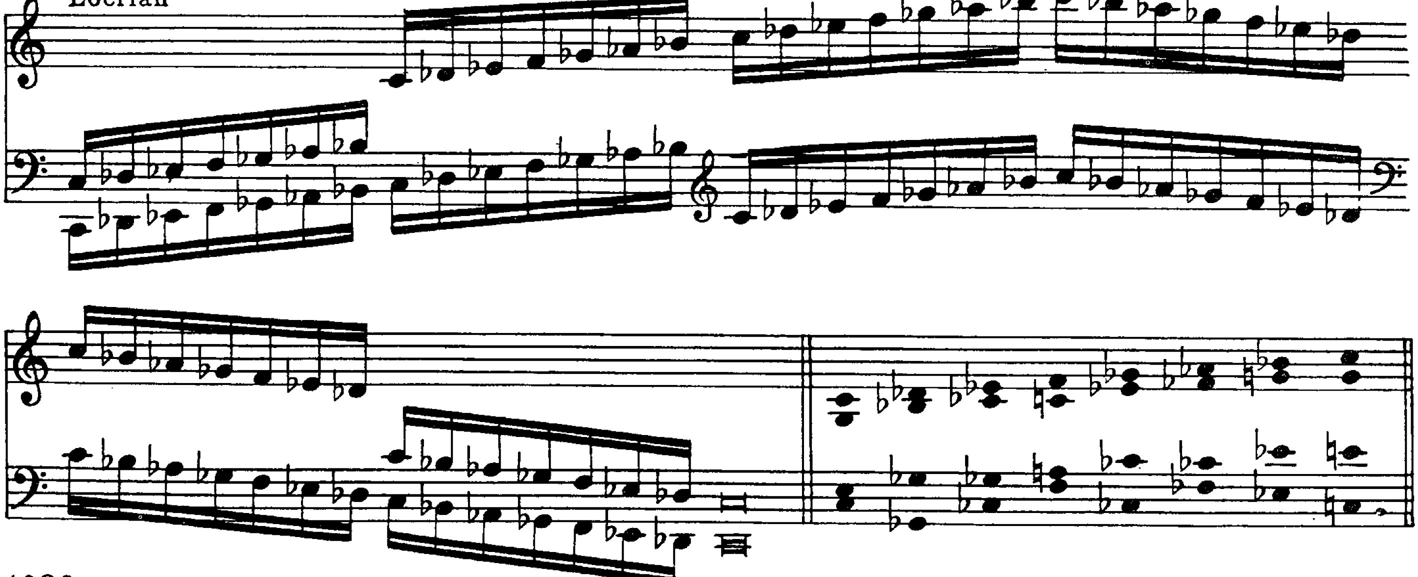


# Heptatonic Scales

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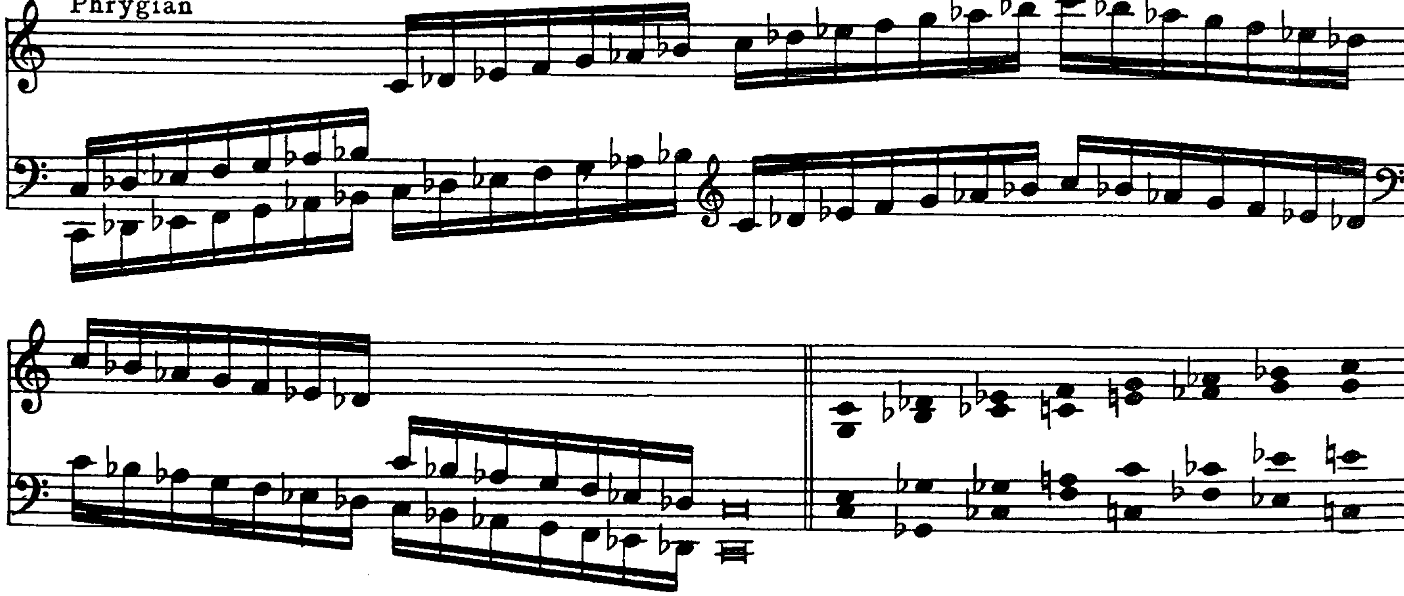


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Locrian
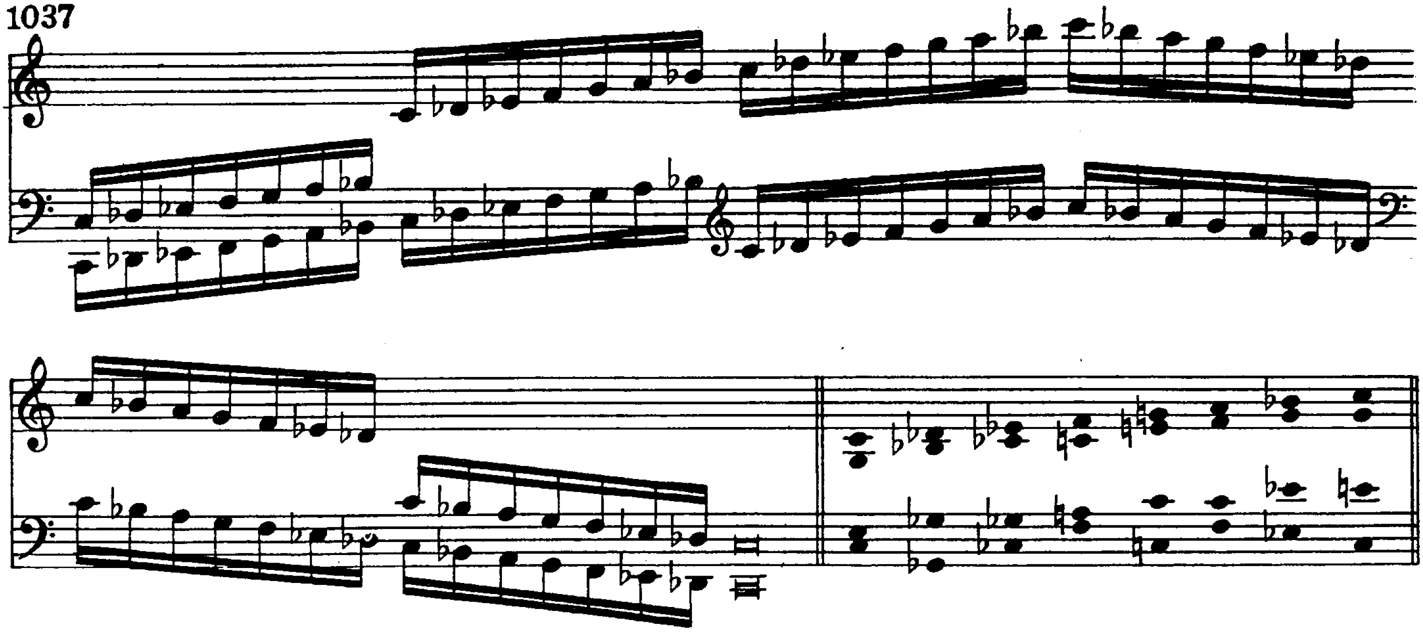


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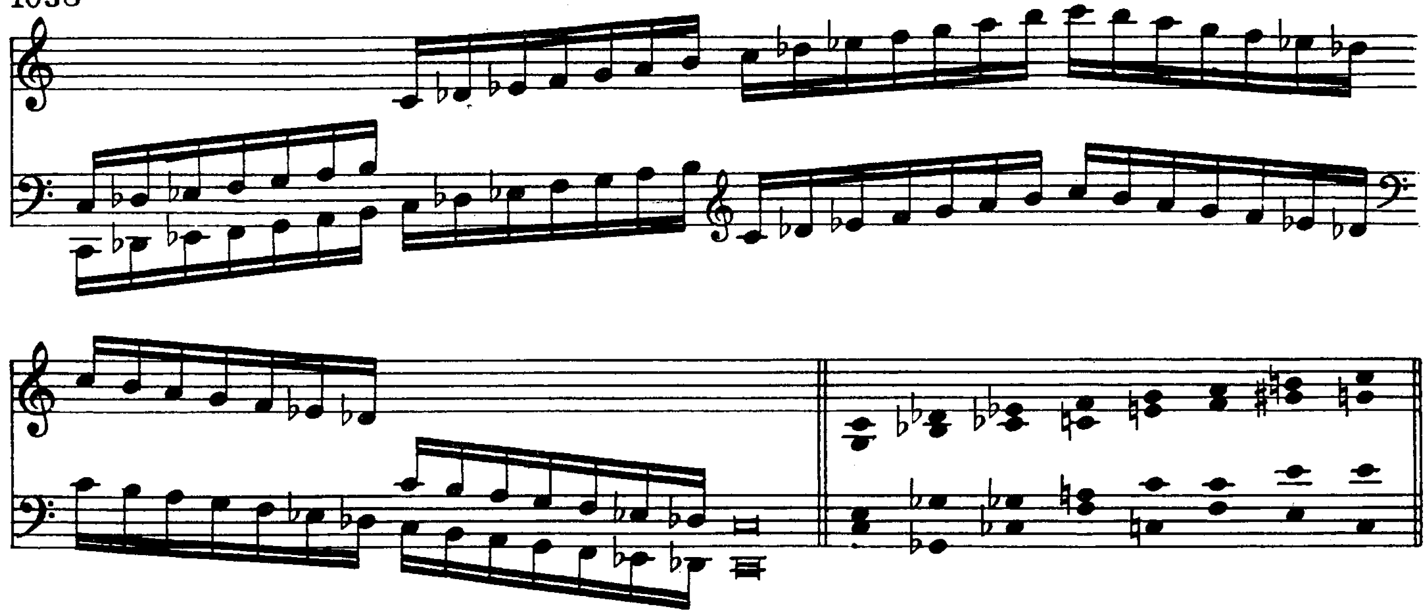
Phrygian
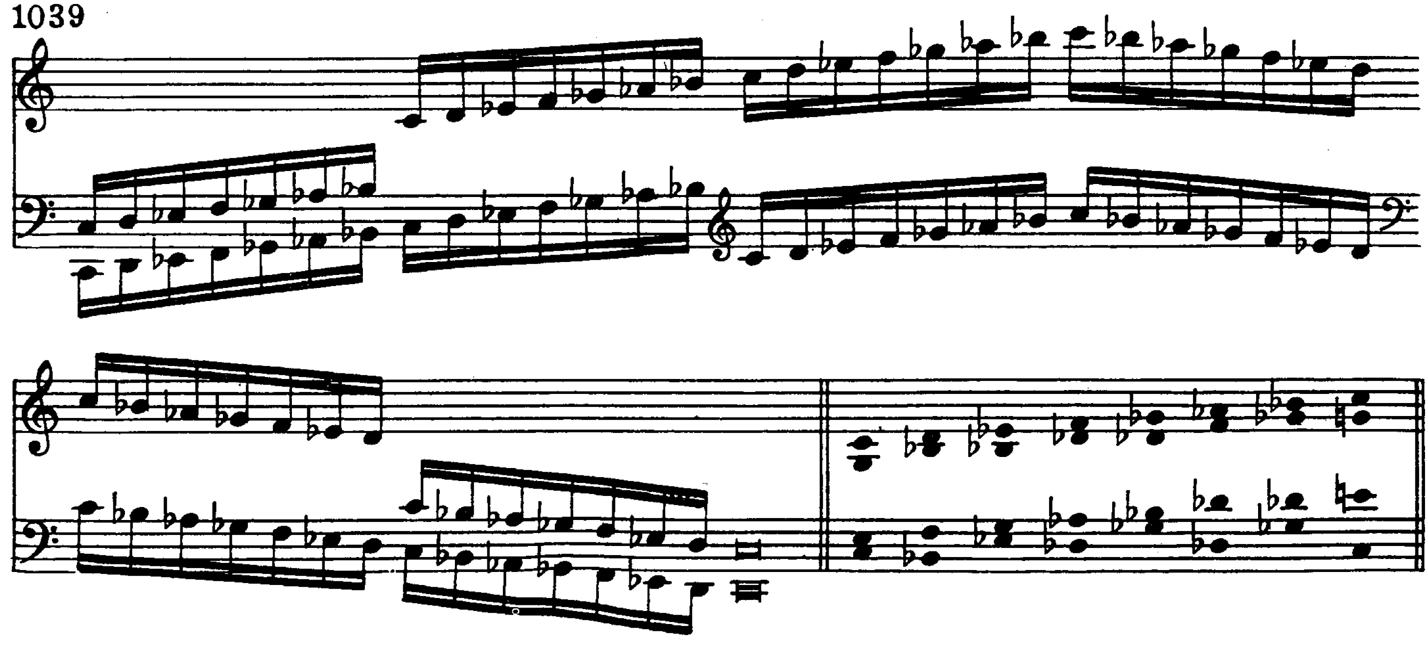


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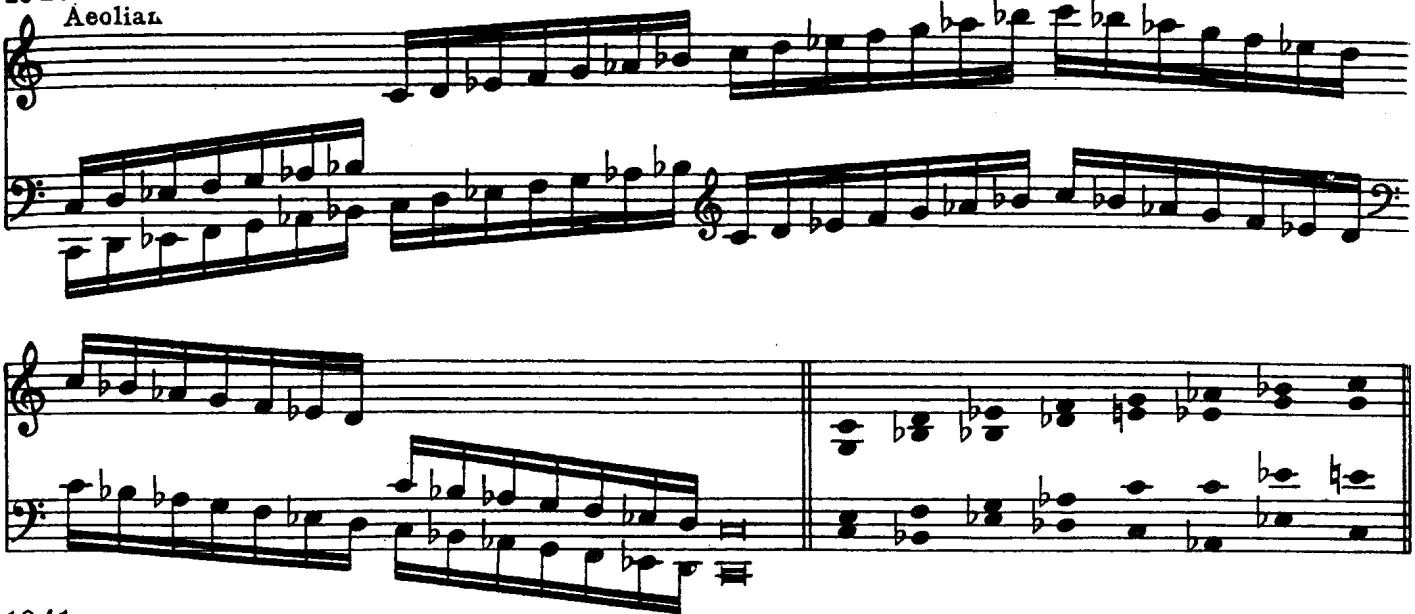


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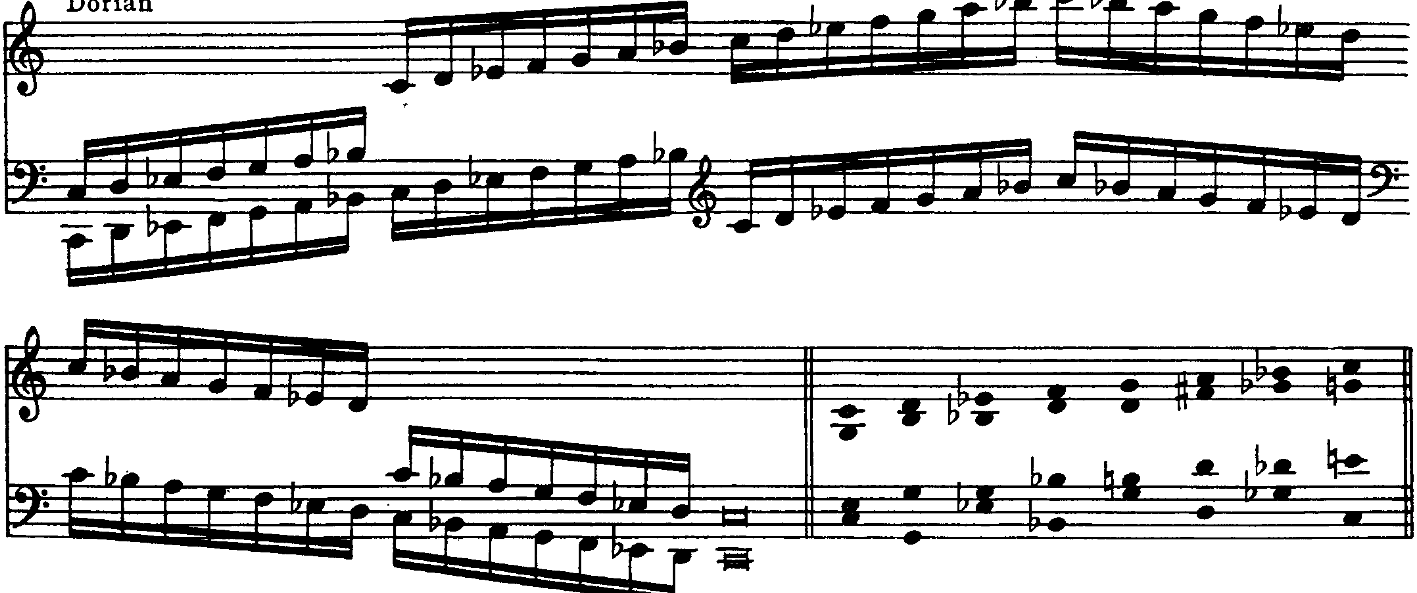


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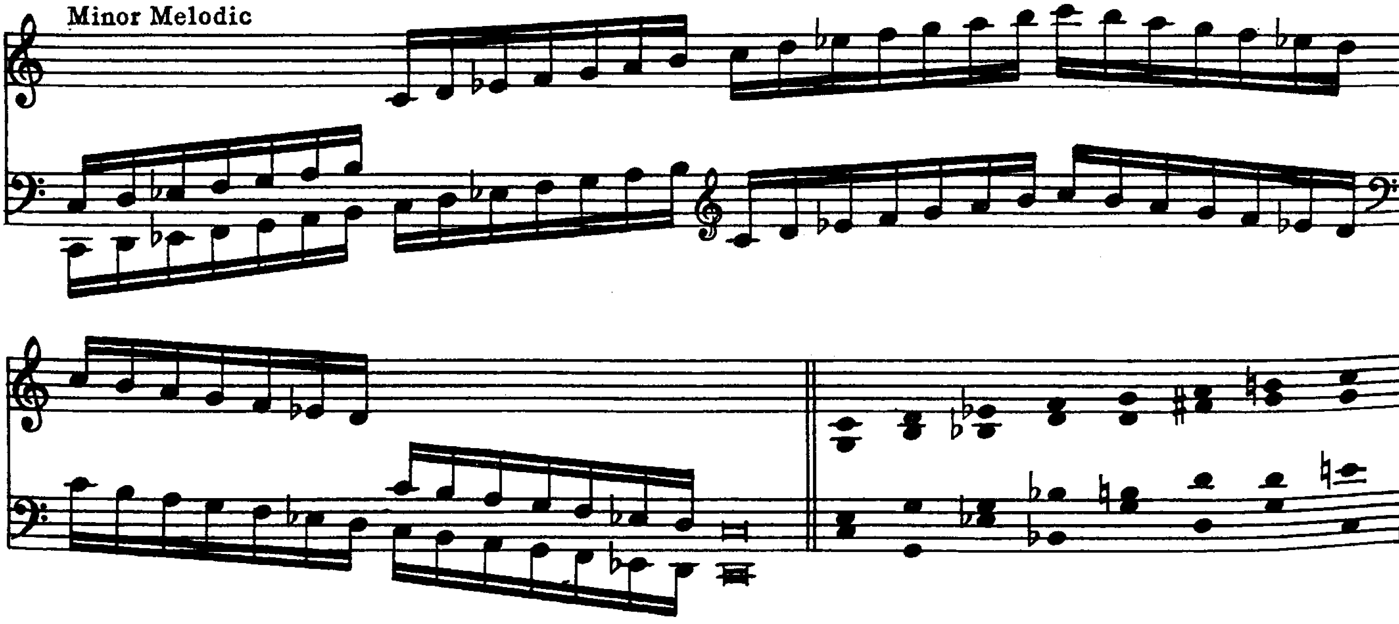


1040
Aeolian
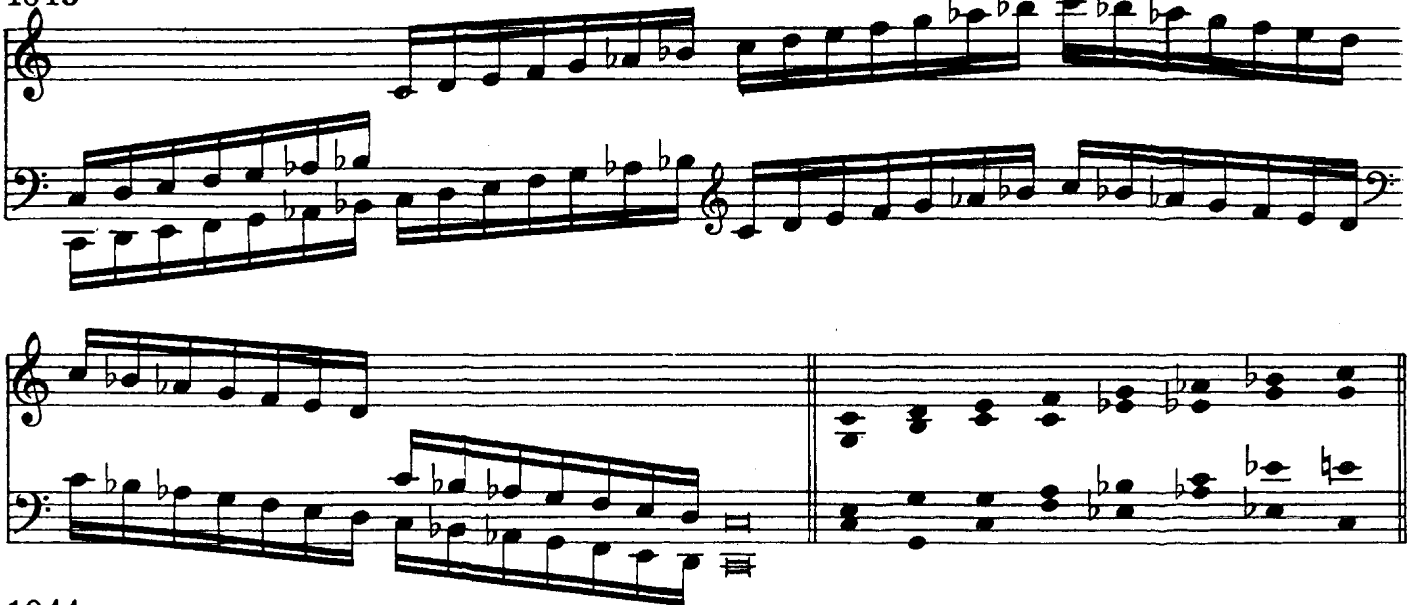


1041
Dorian



1042
Minor Melodic
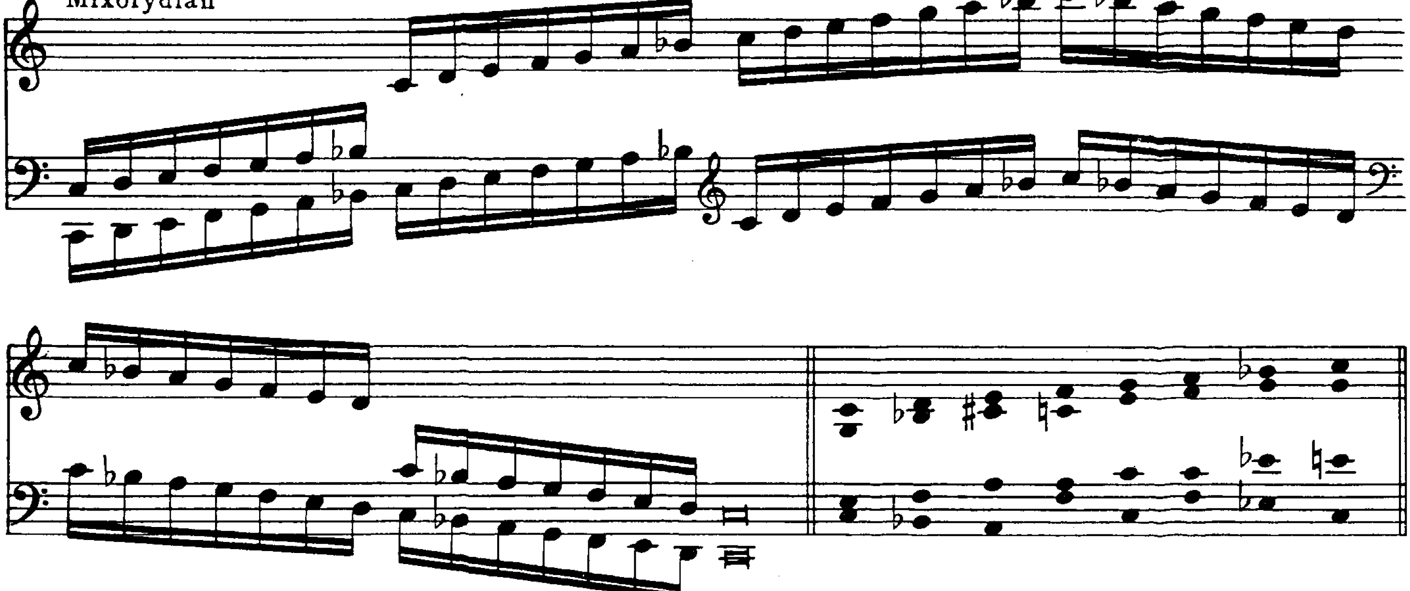


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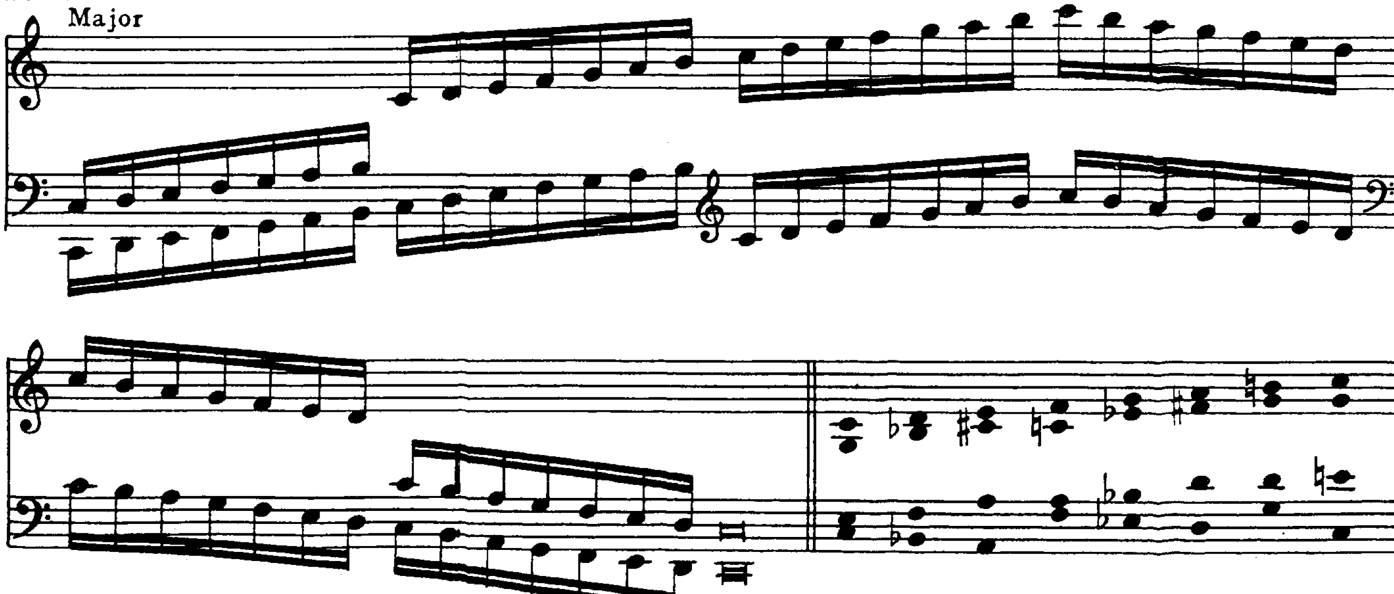


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Mixolydian
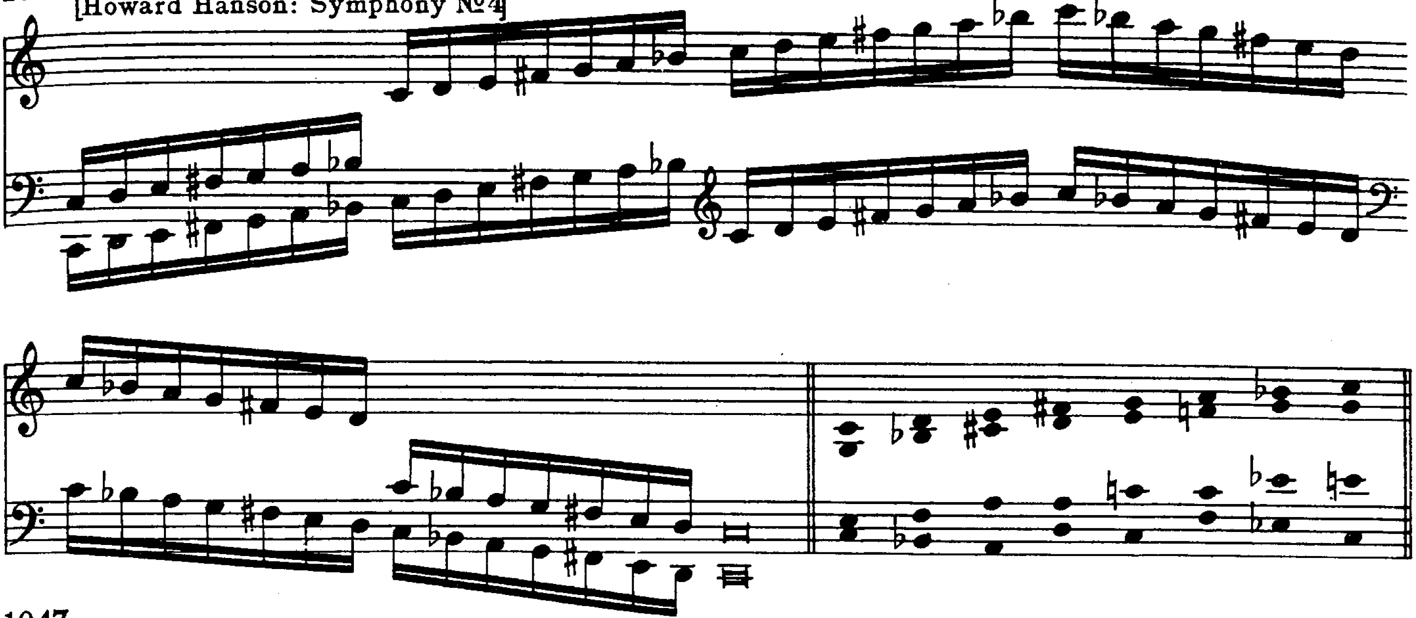


1045

Major
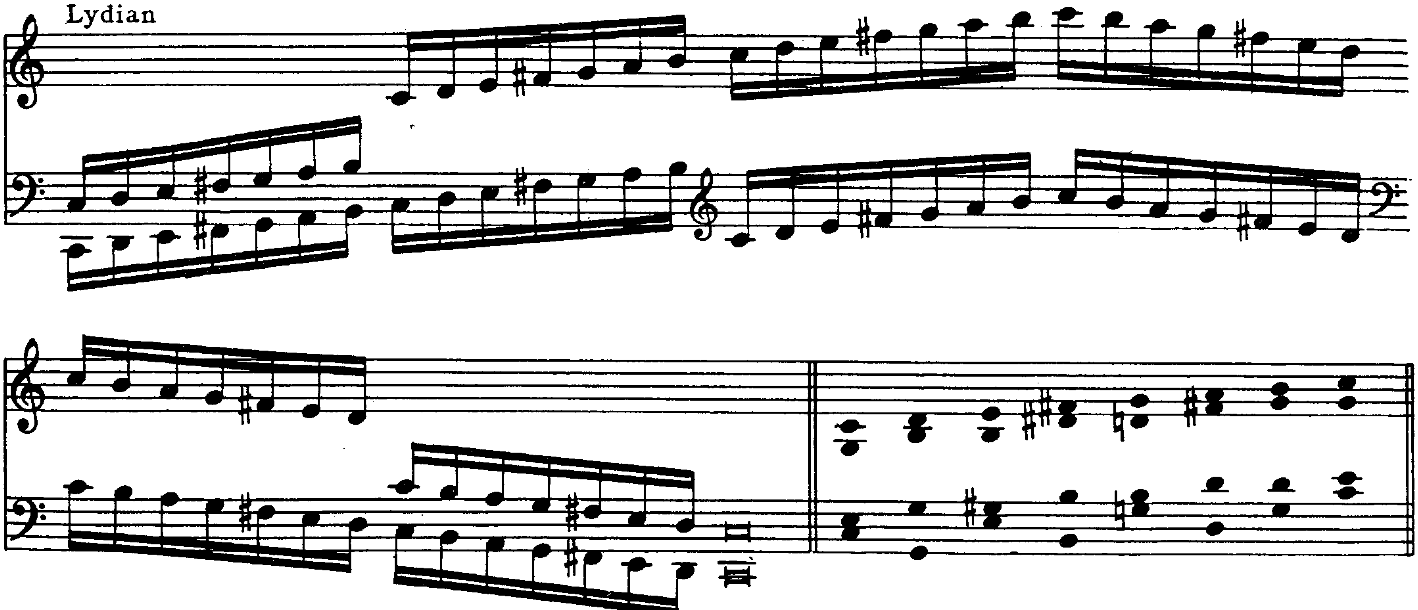


1046 [Howard Hanson: Symphony №4]
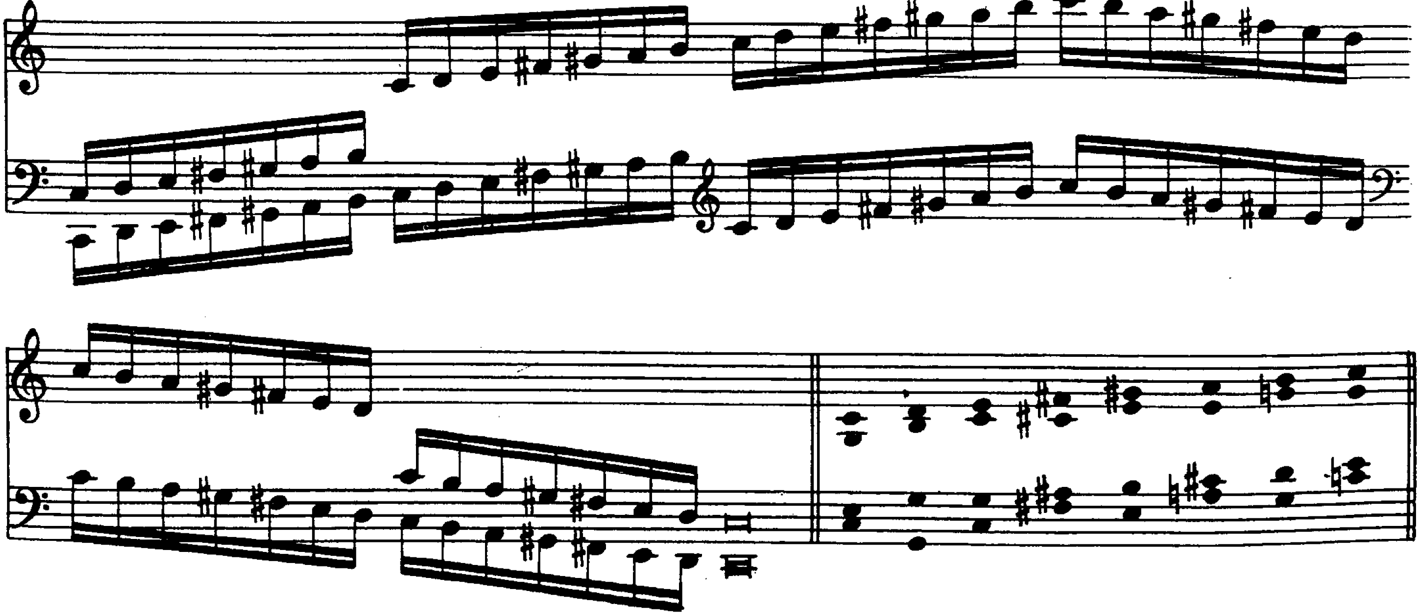


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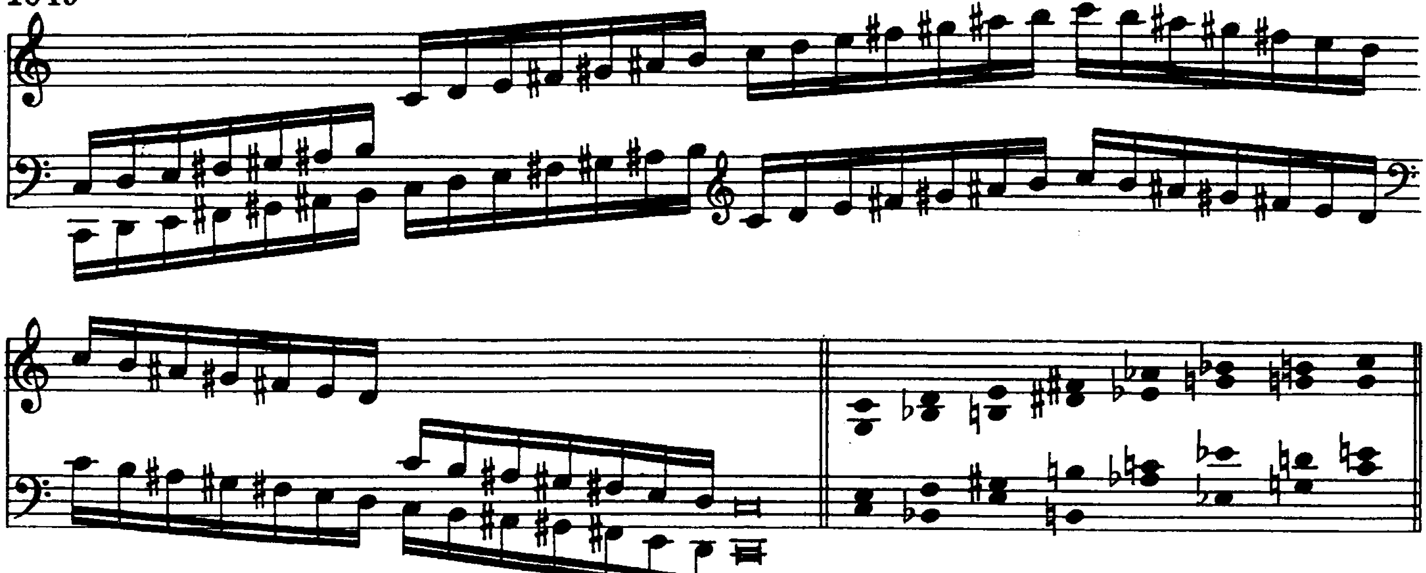
Lydian



1048

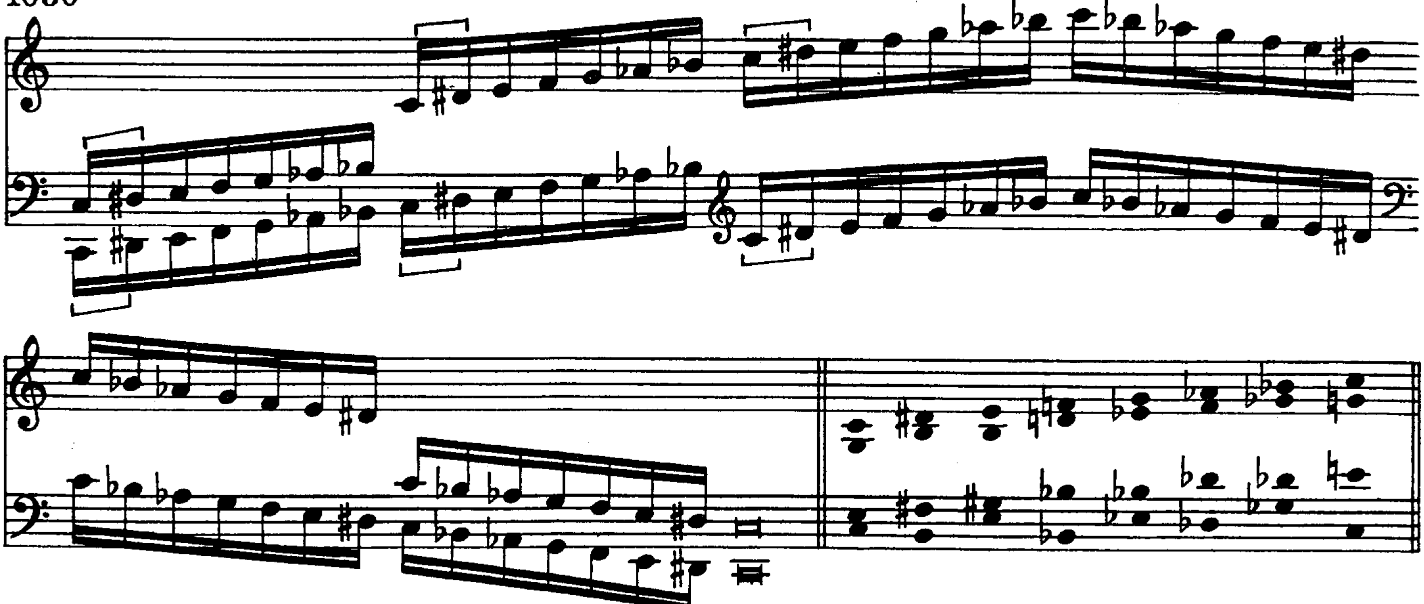


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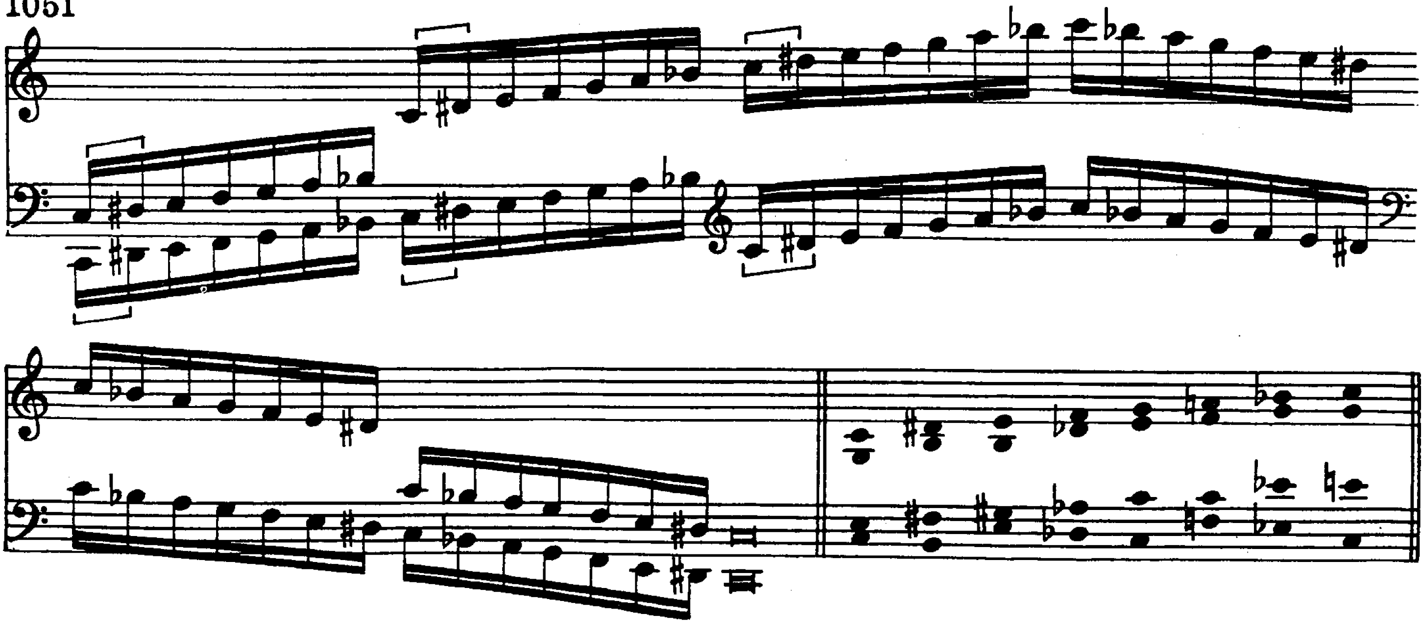


## Heptatonic Scales with an Augmented Second
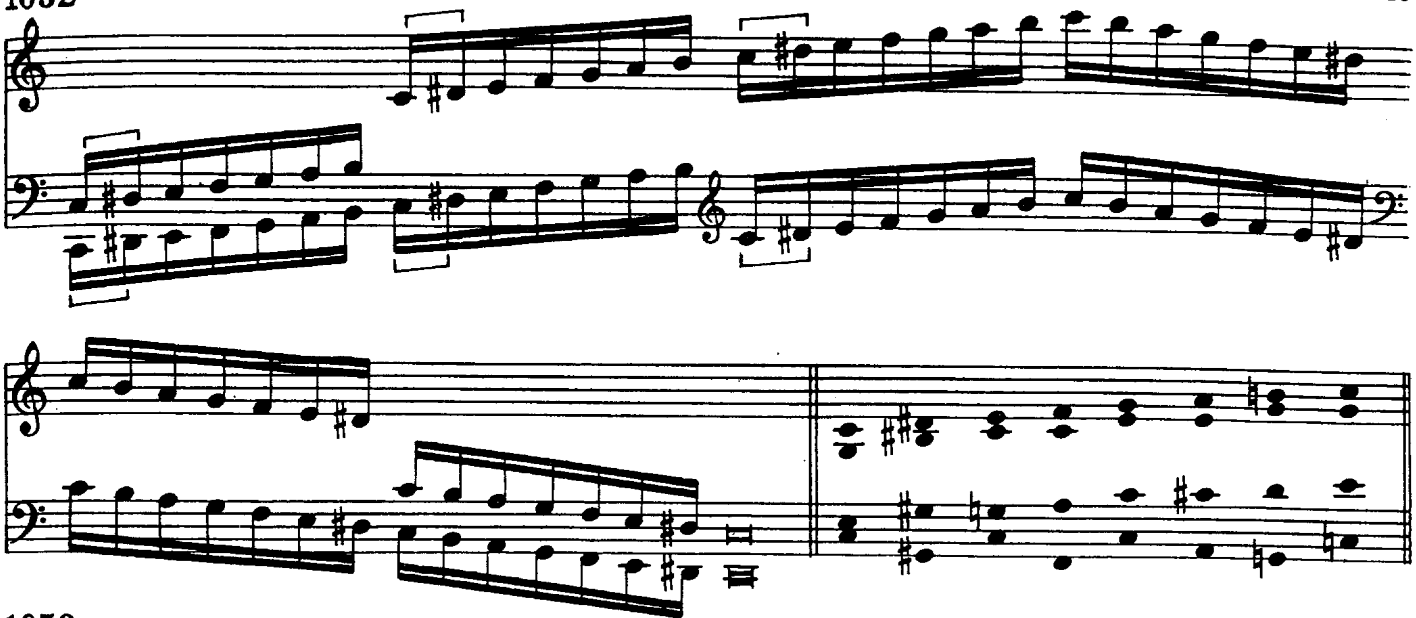
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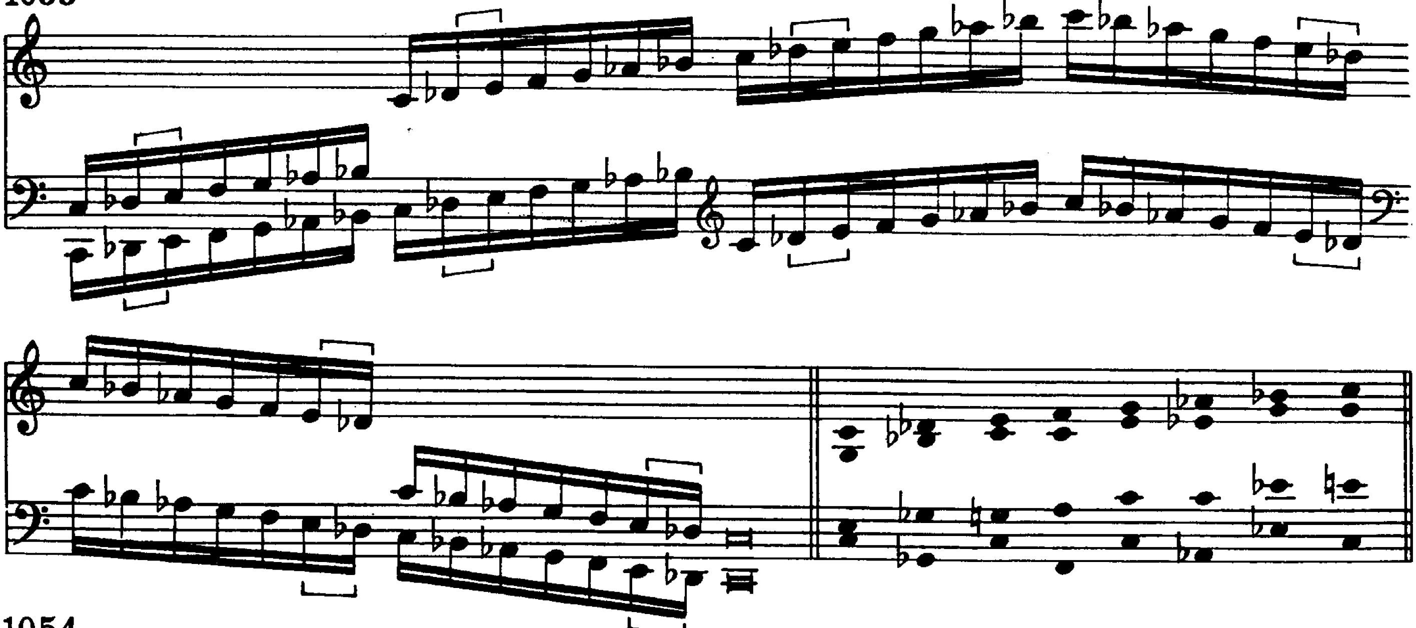


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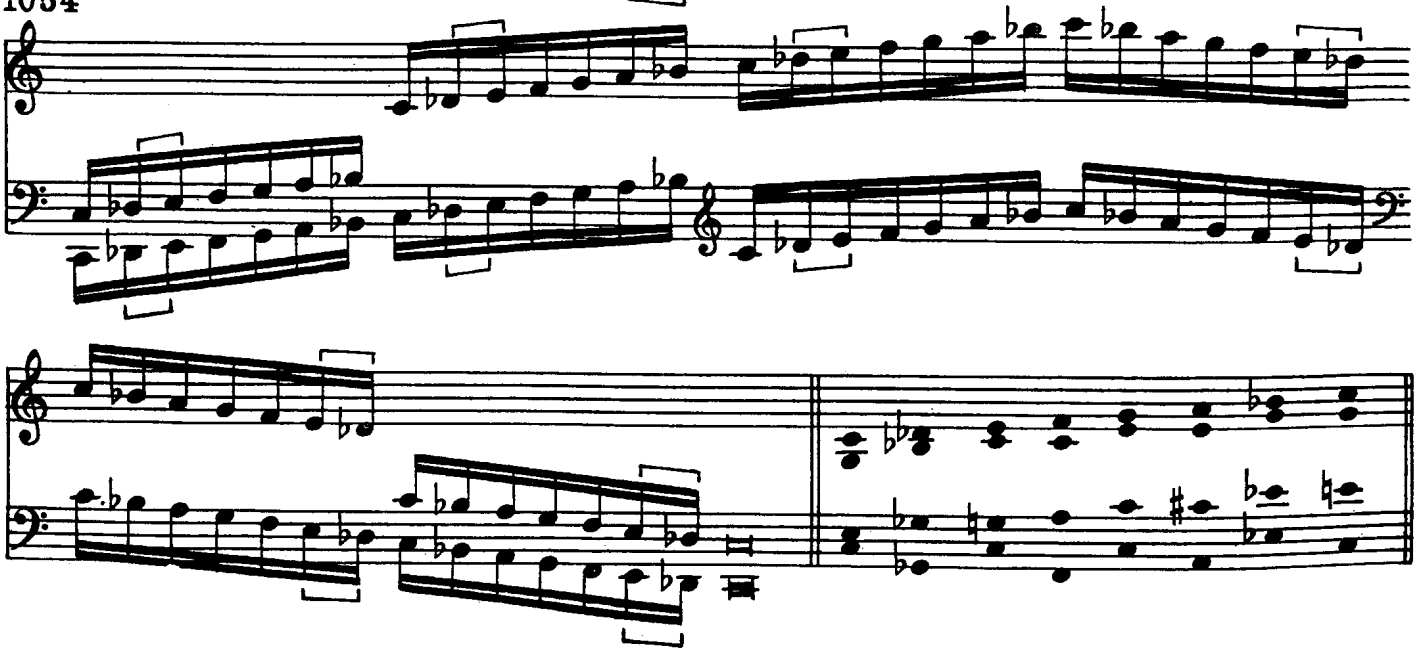


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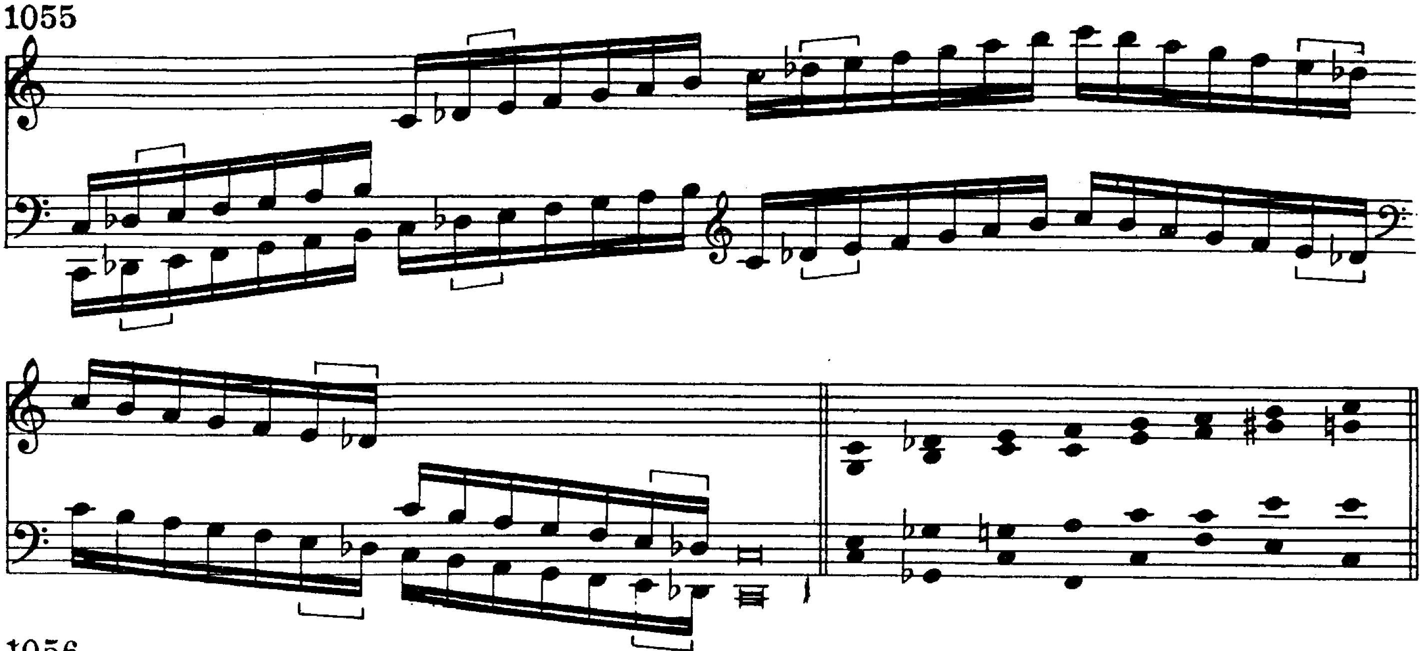
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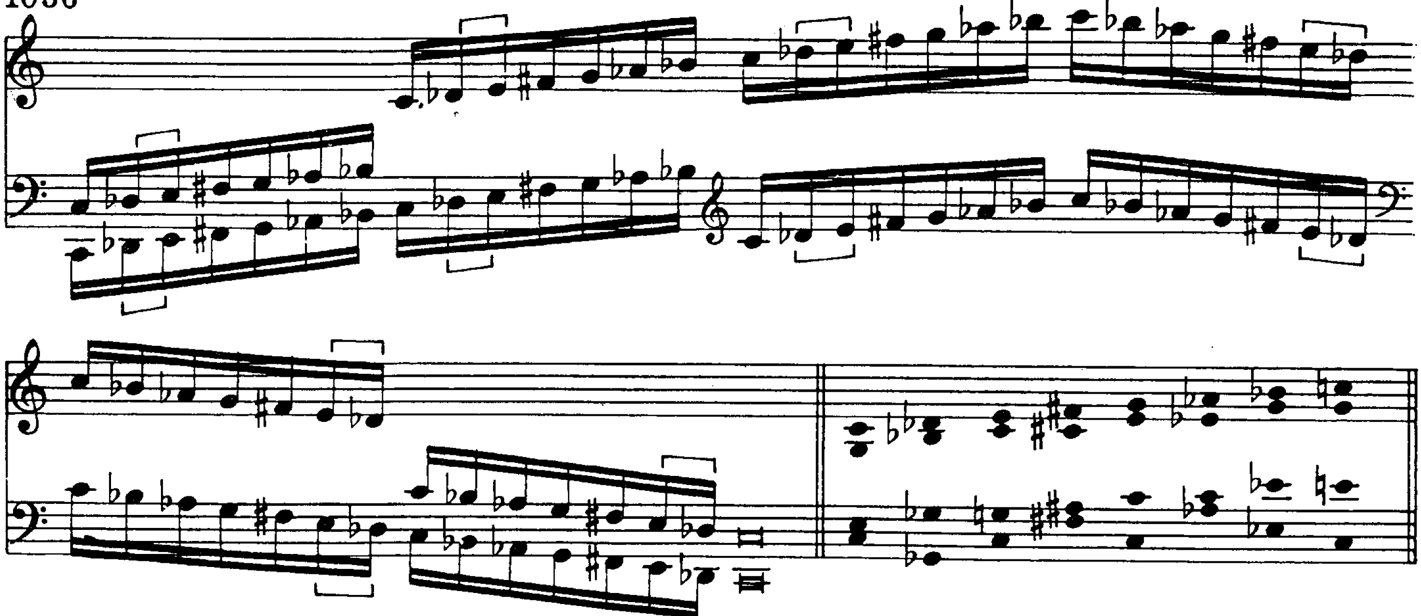


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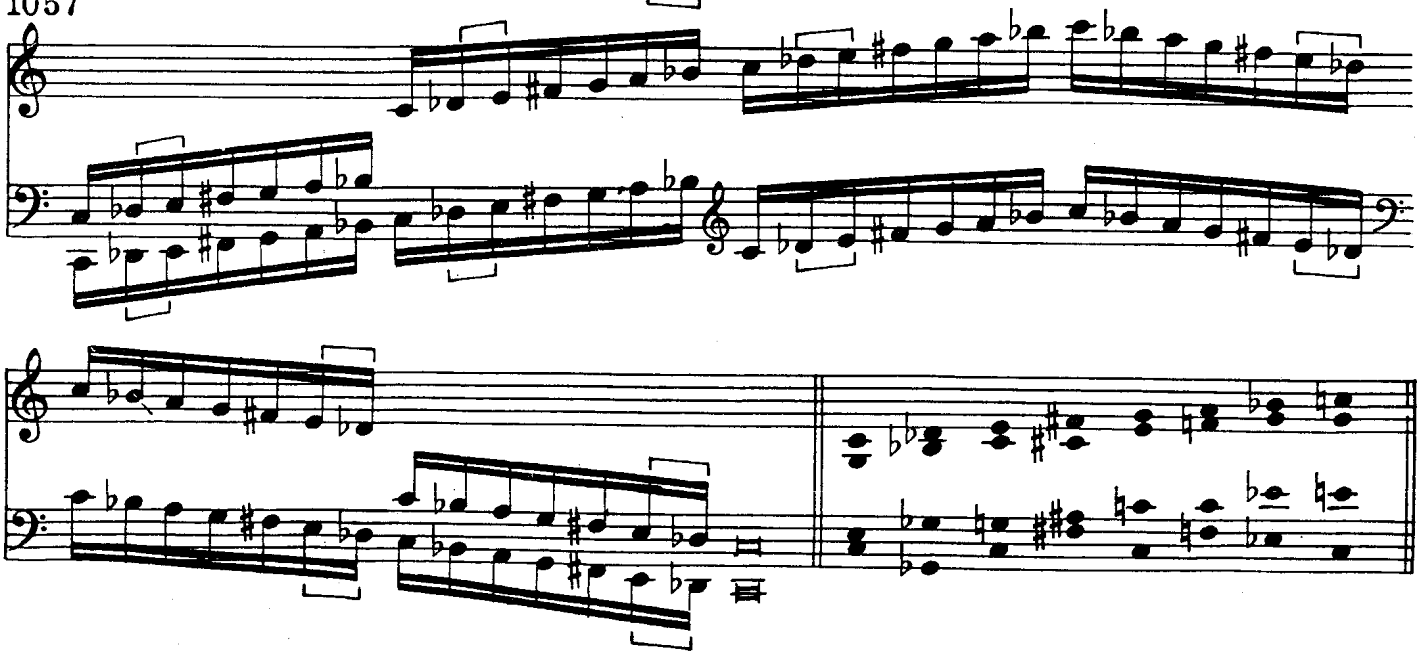


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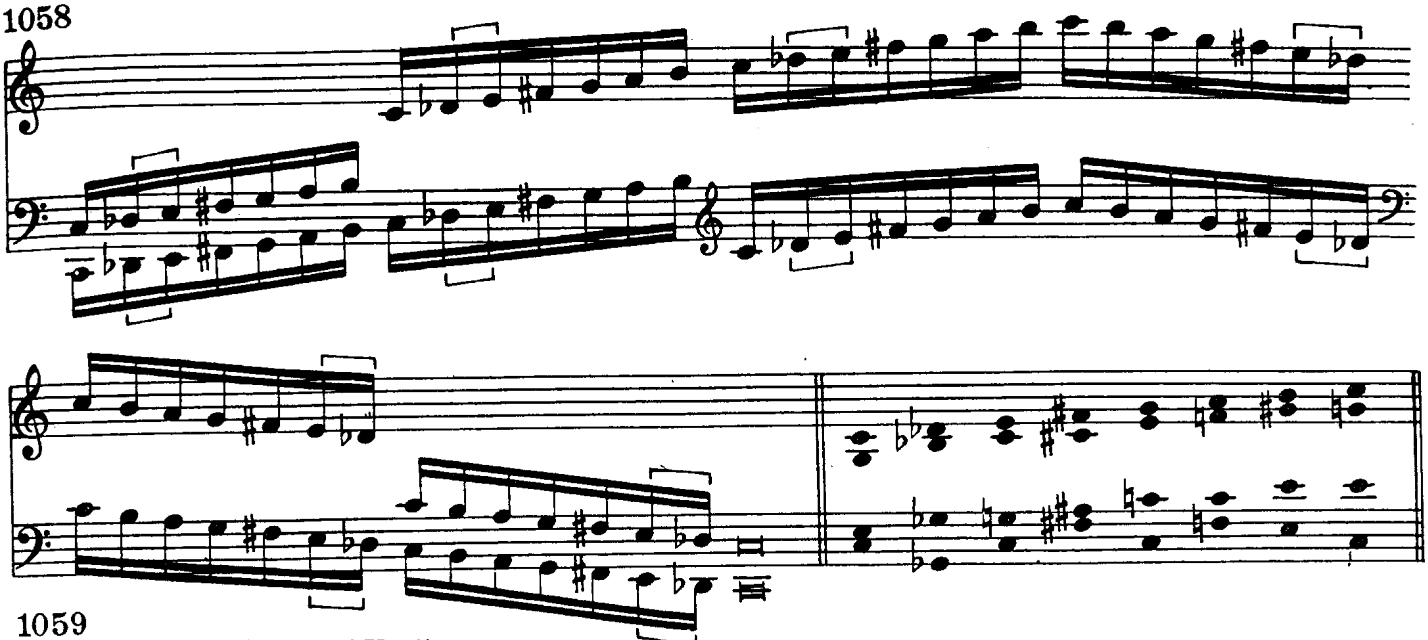


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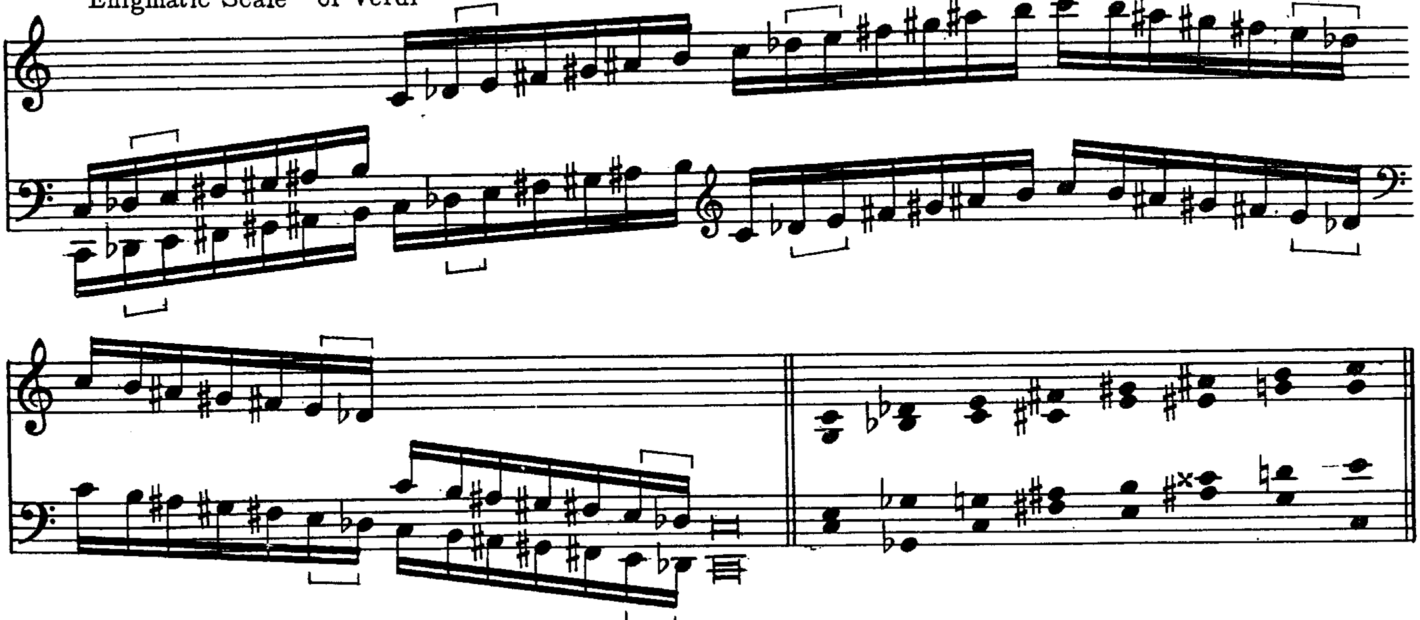


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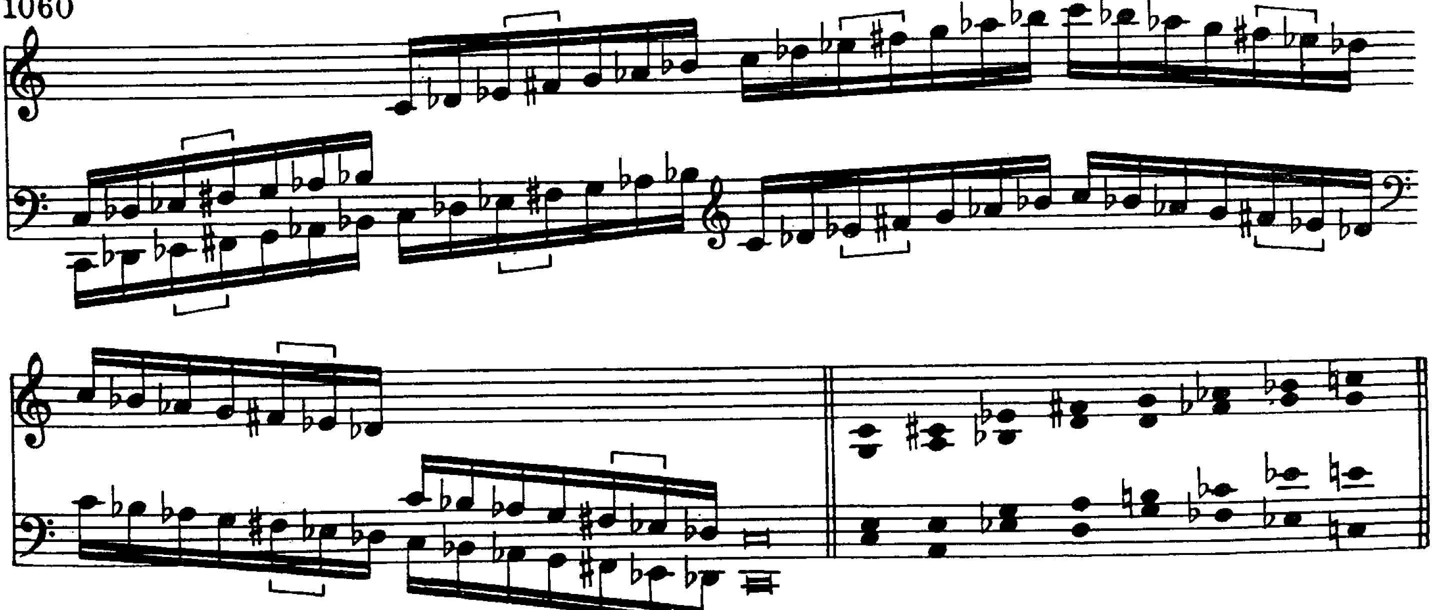


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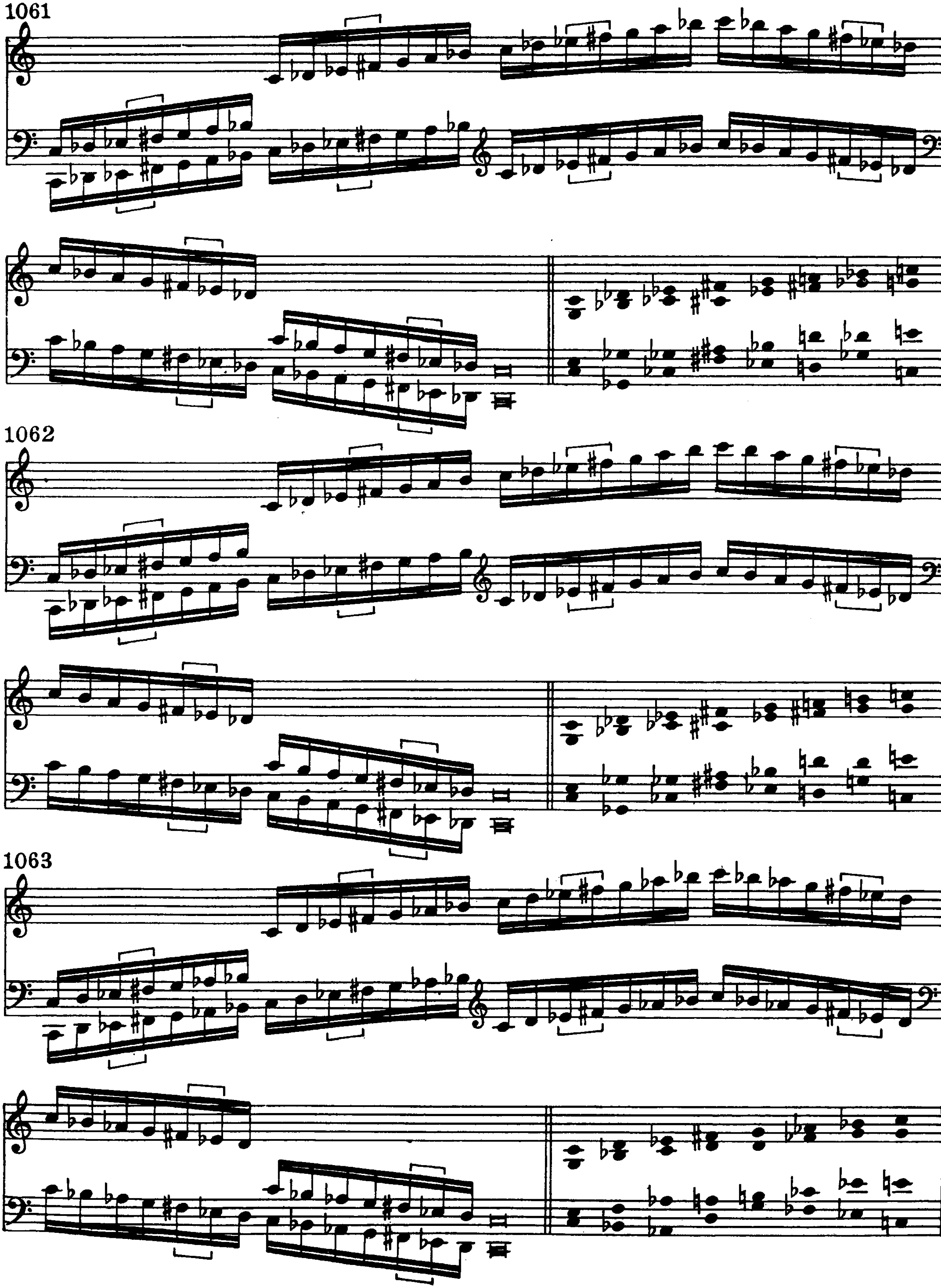
"Enigmatic Scale" of Verdi



1060
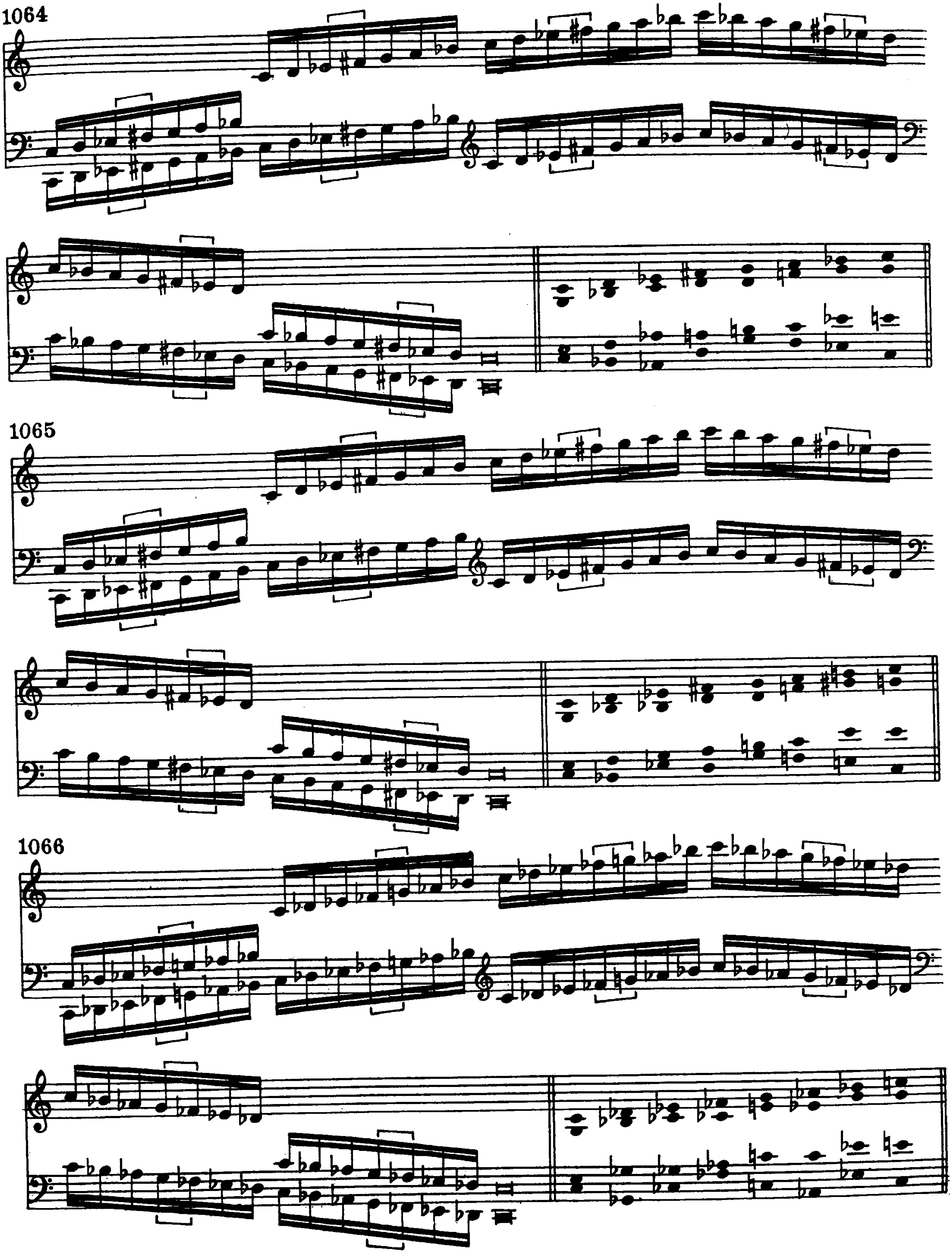


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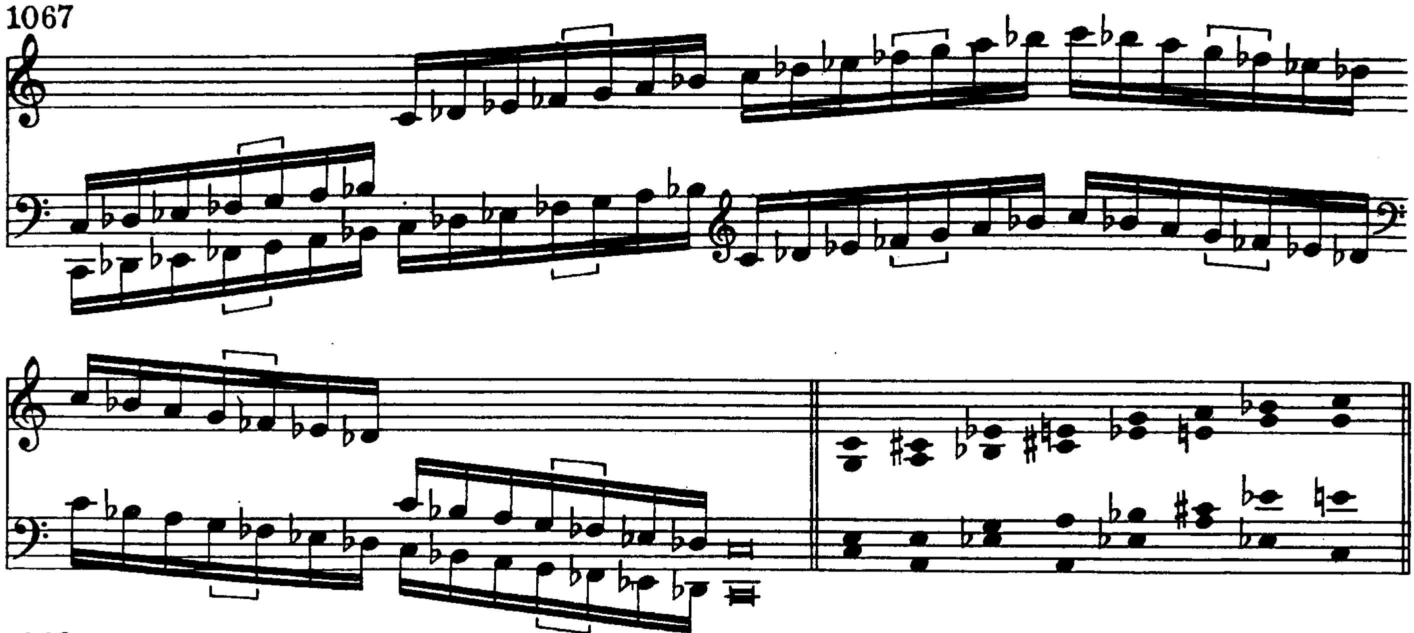


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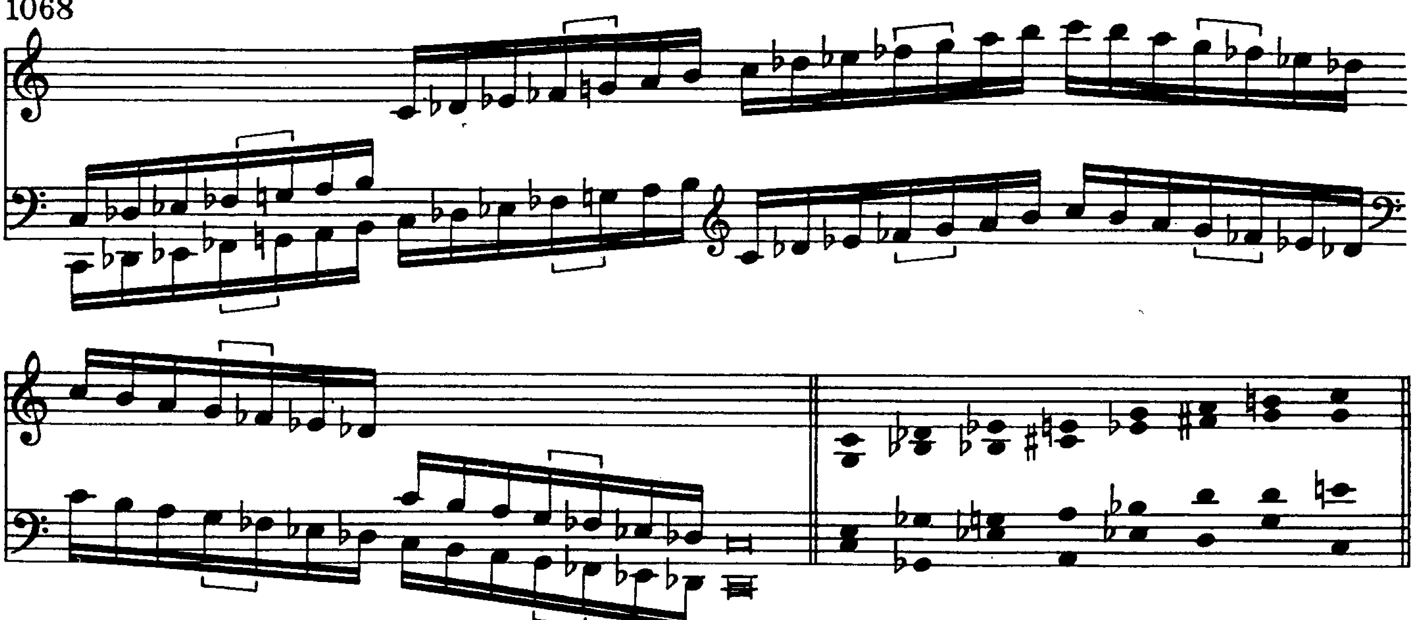
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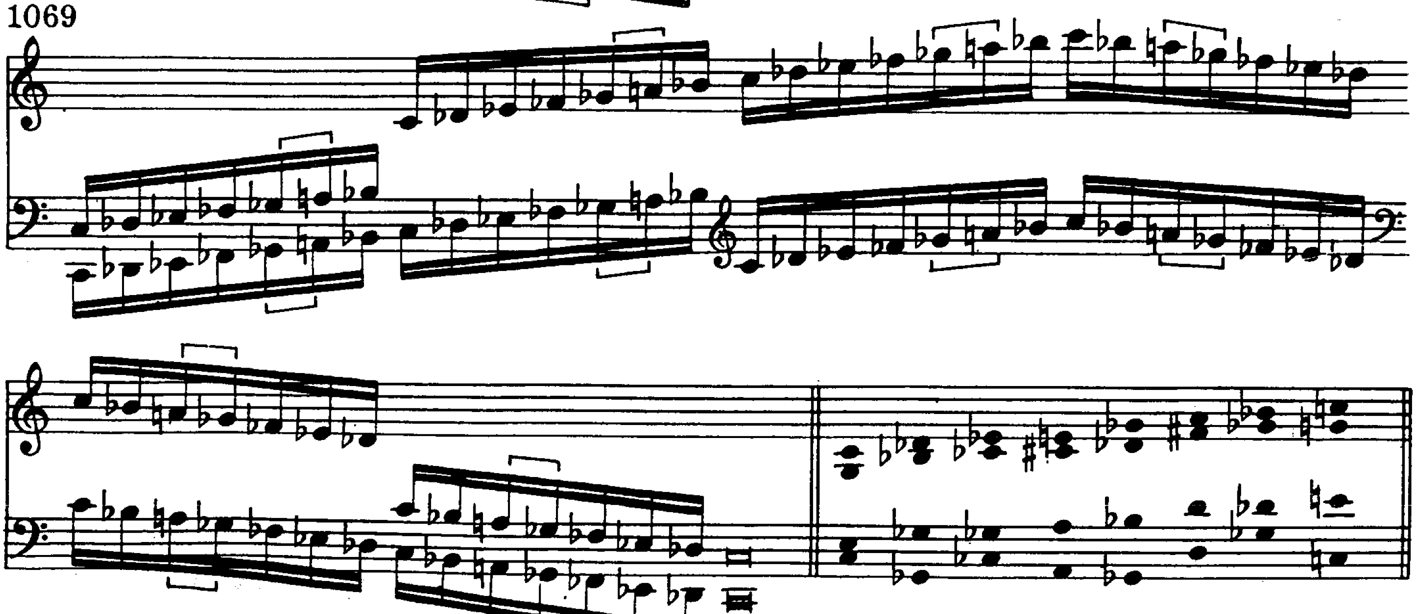
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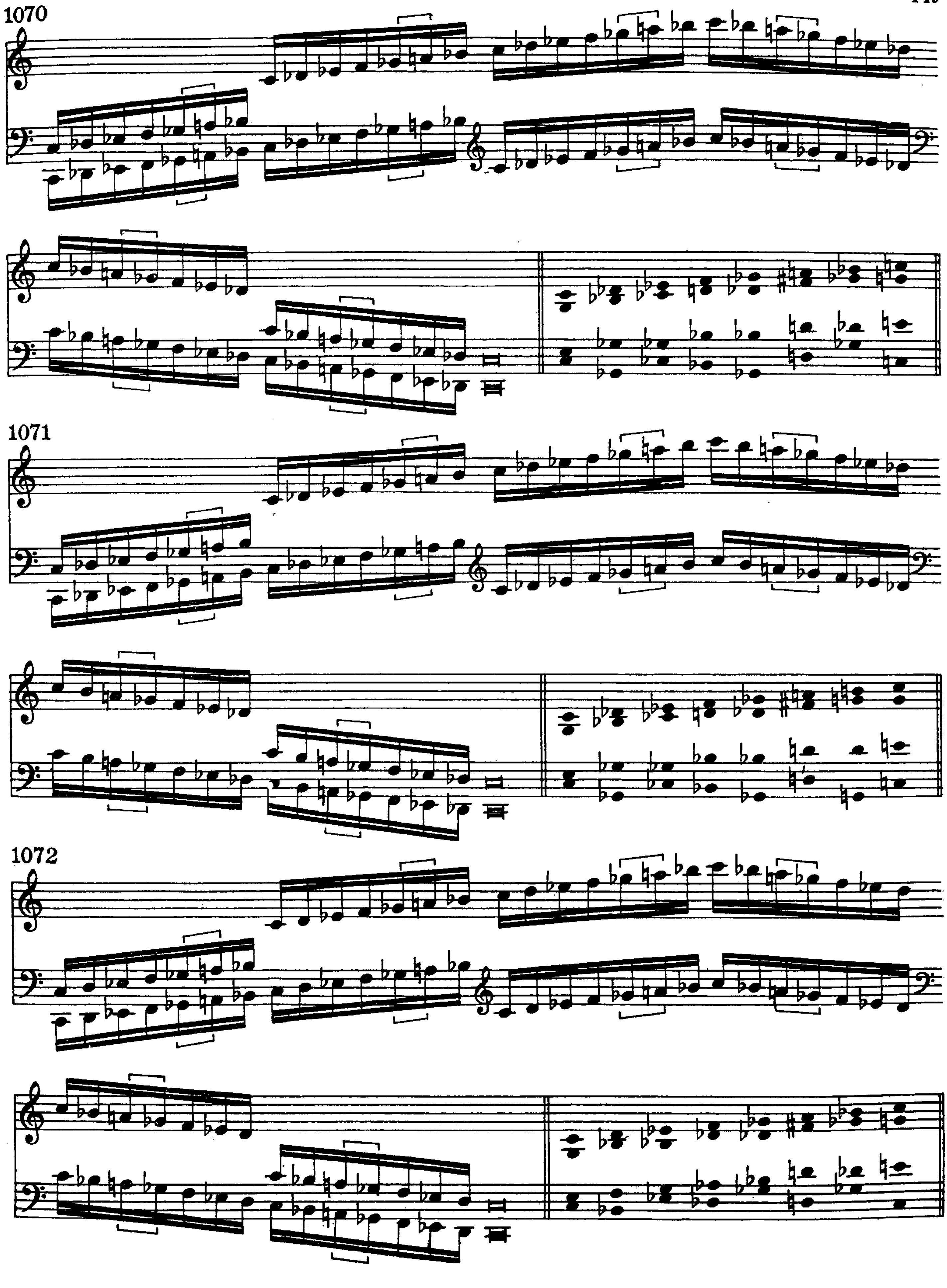


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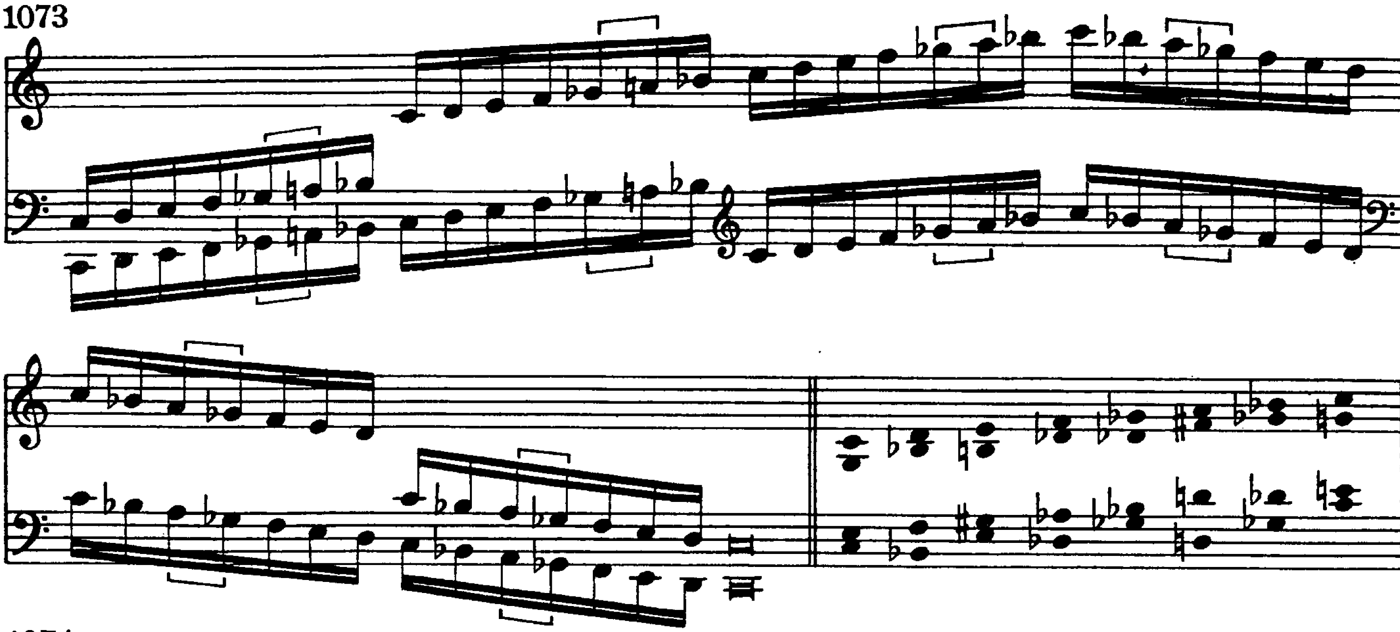


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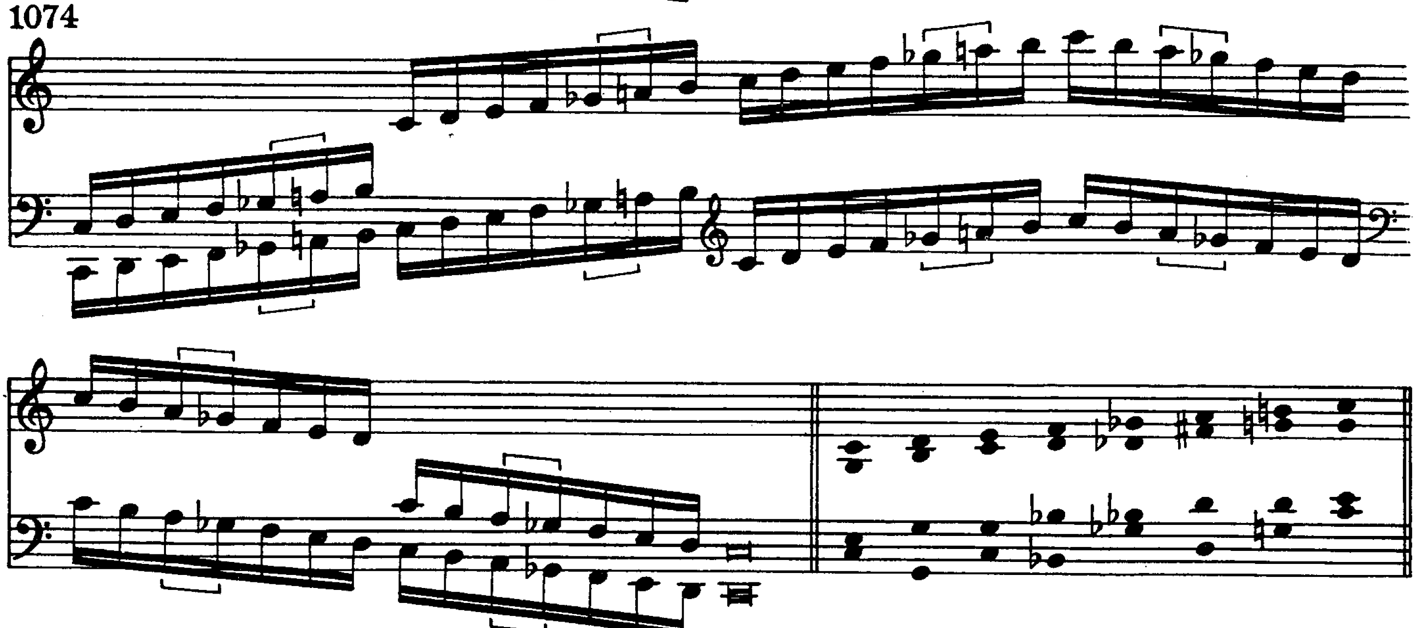



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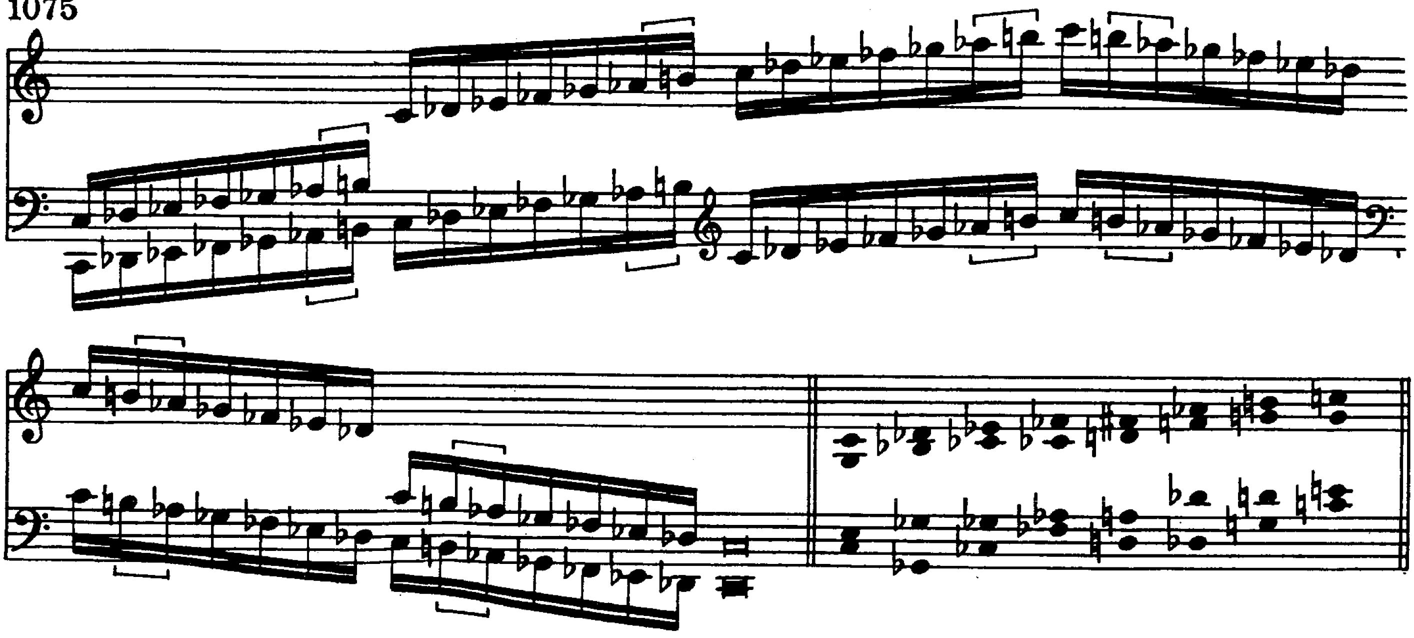
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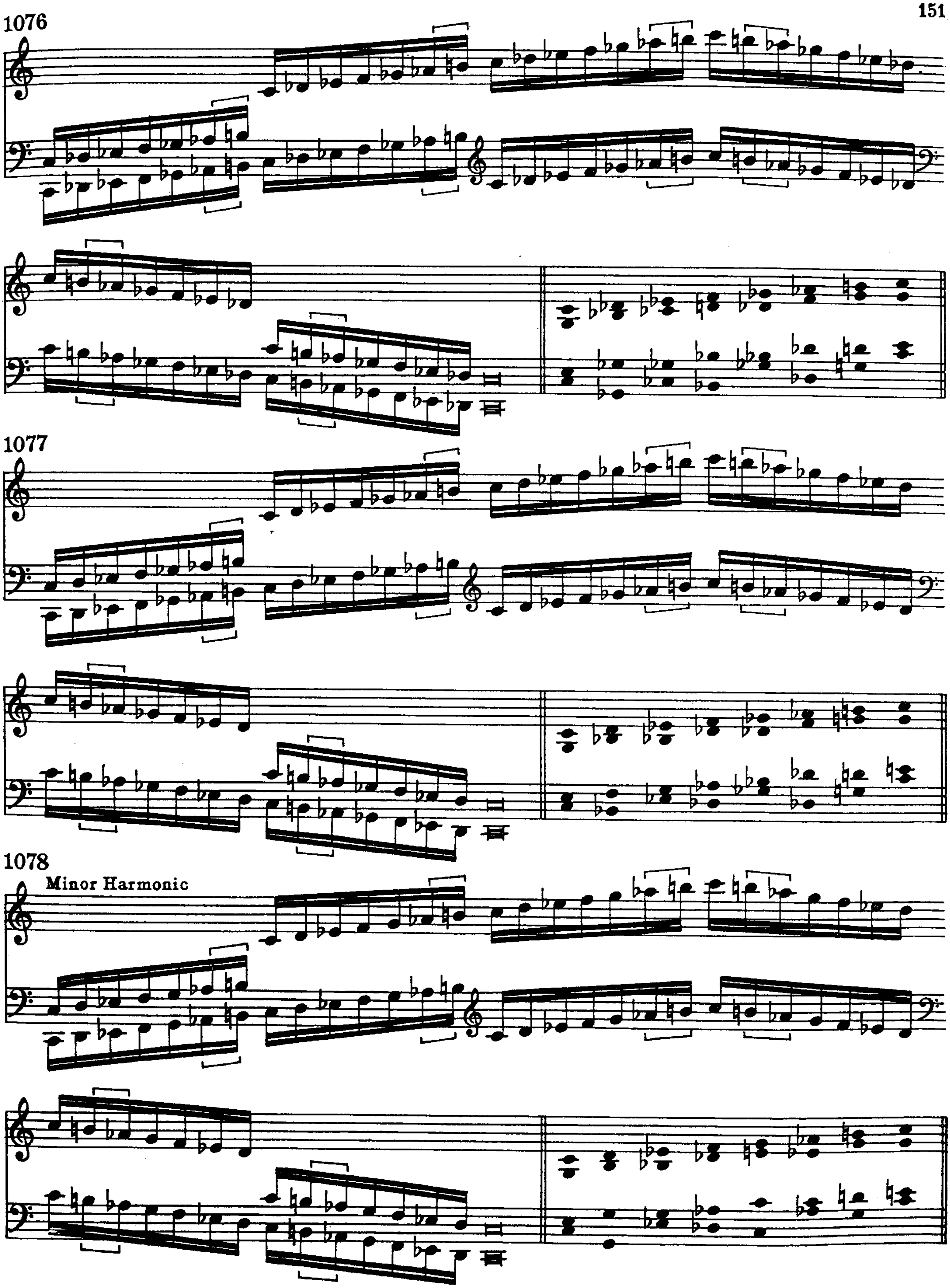


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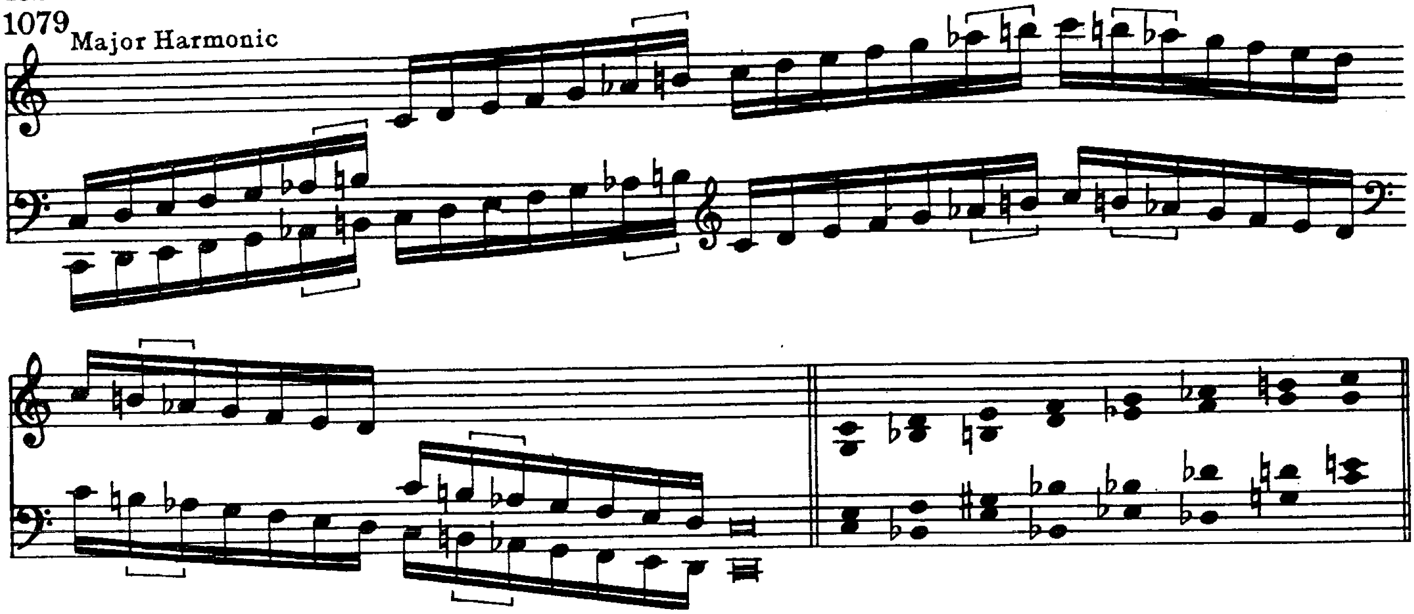


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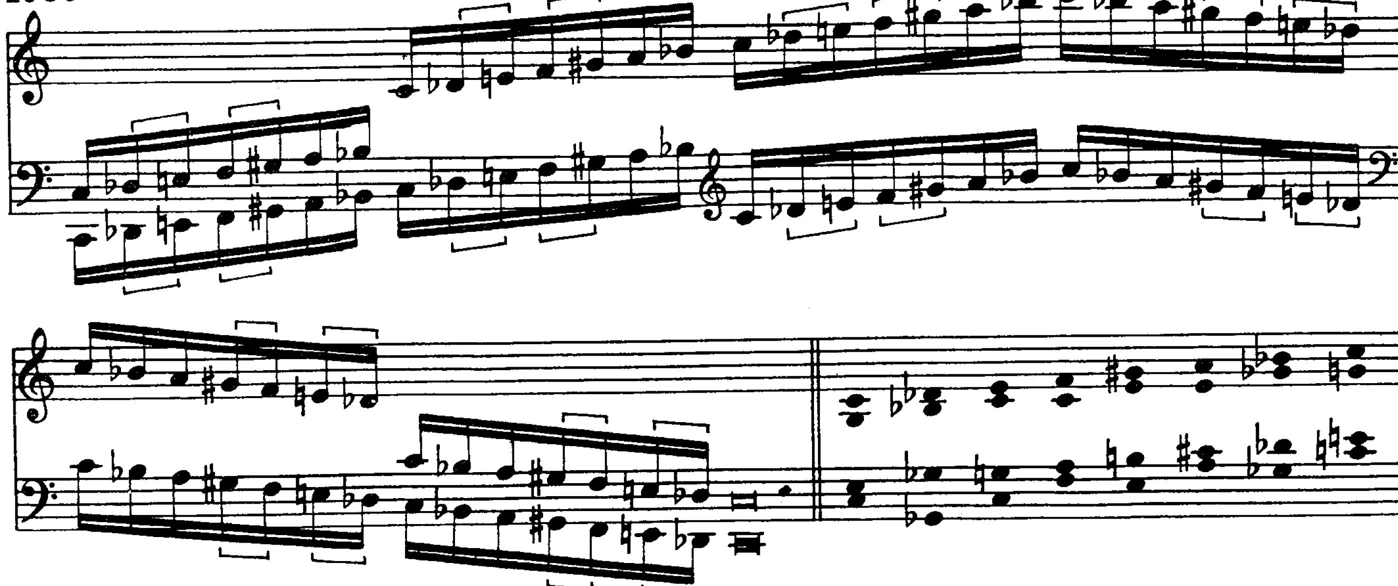



1076
1077
1078
Minor Harmonic

1079 Major Harmonic
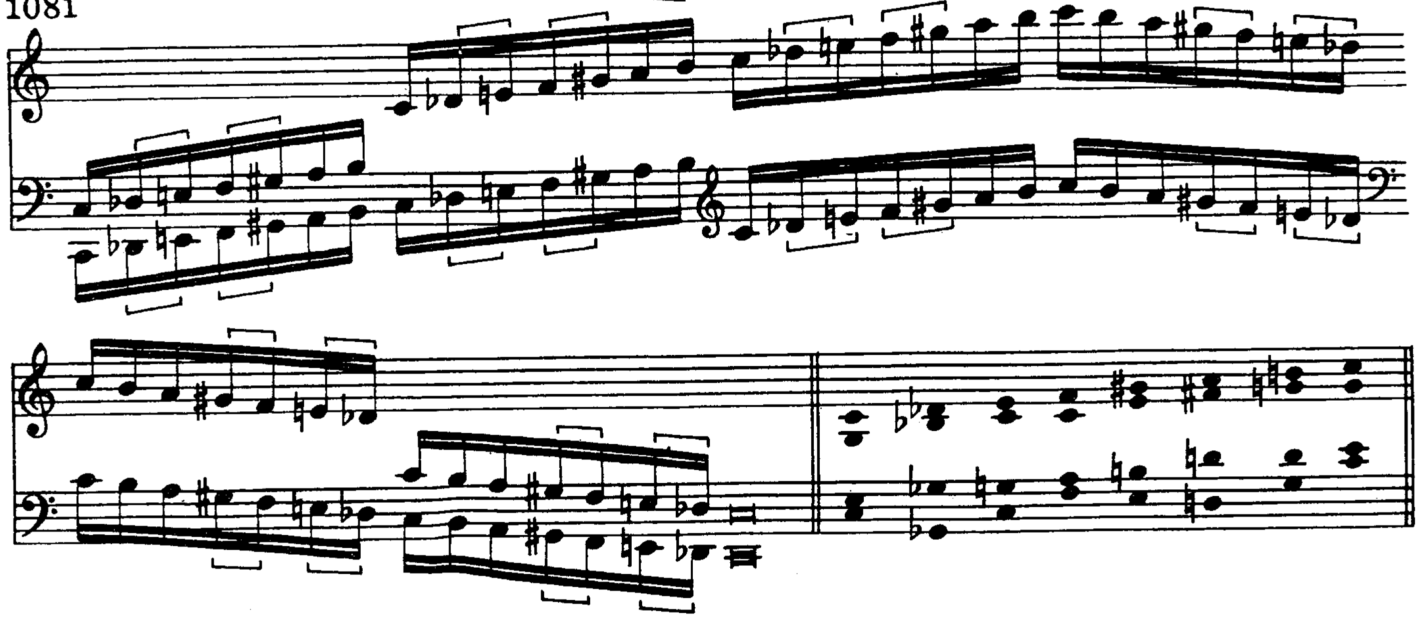


## Heptatonic Scales with Two Augmented Seconds
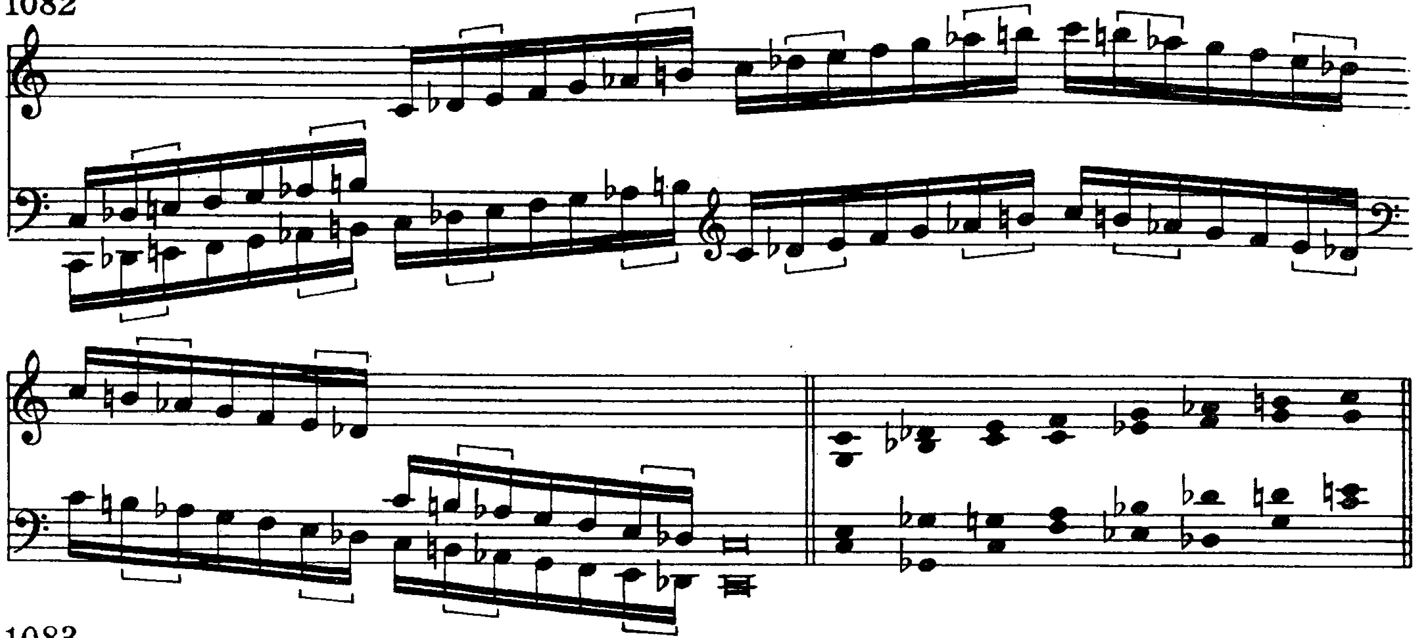
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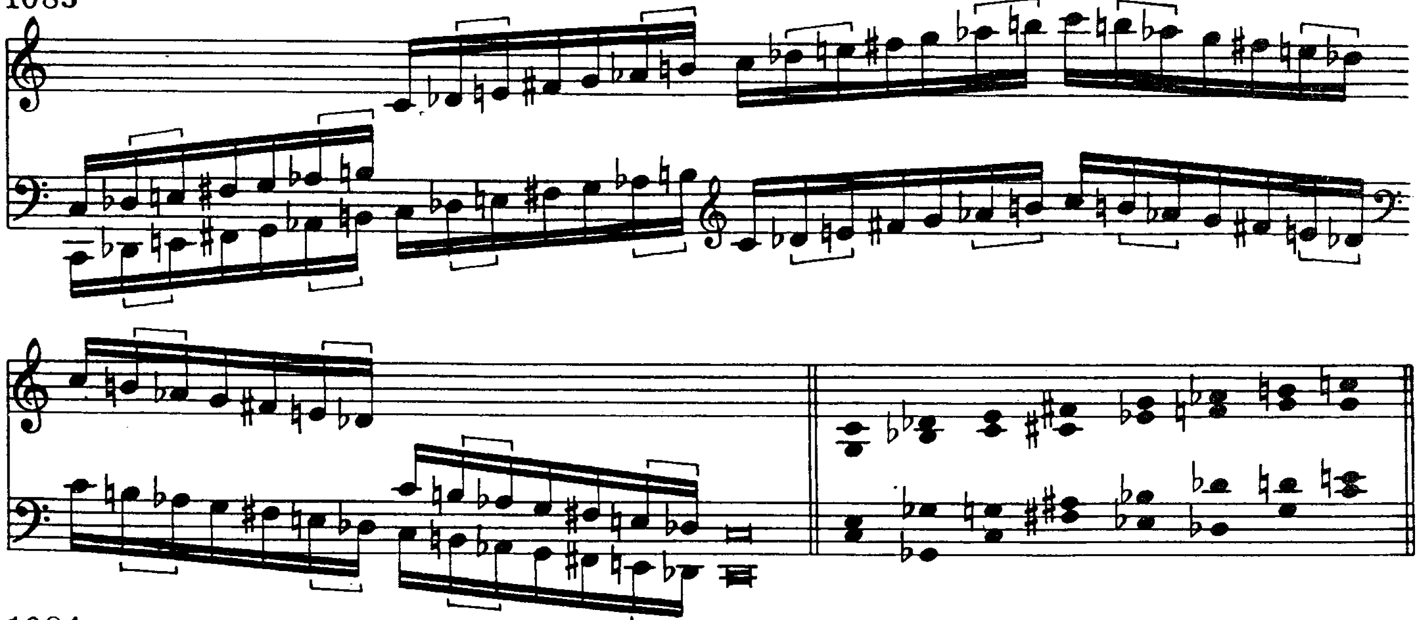


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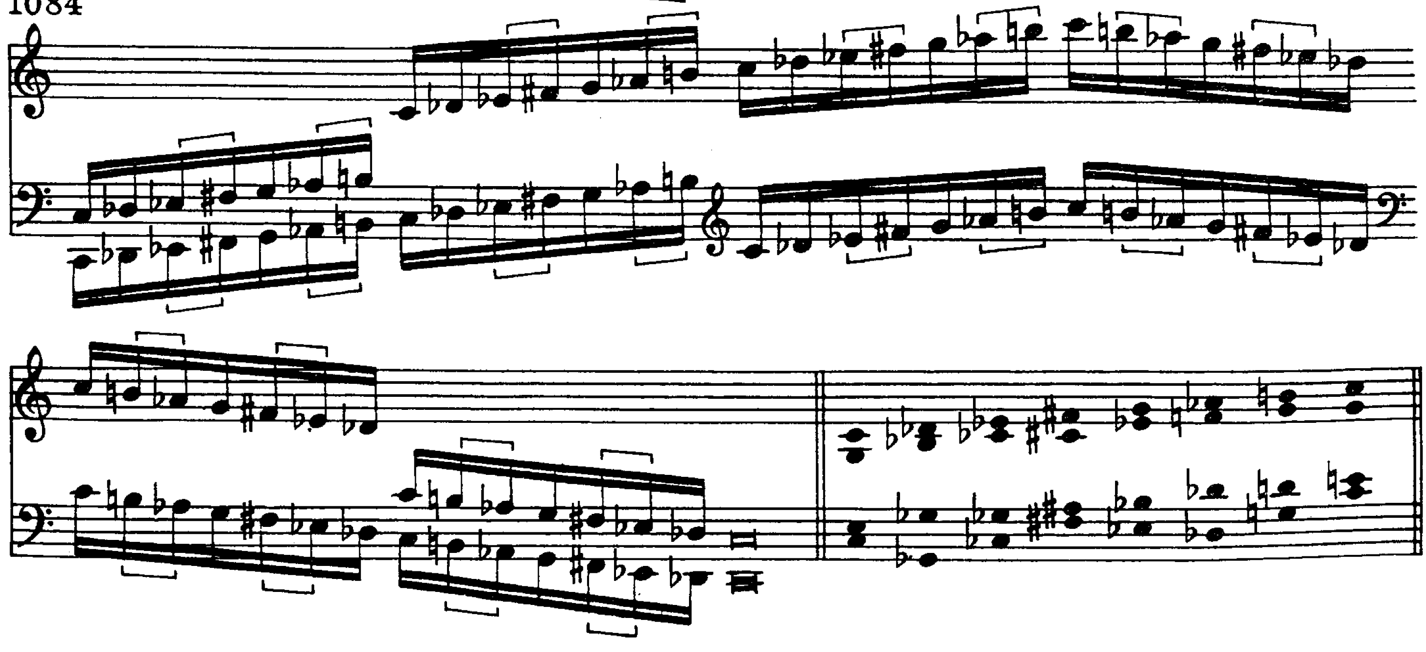


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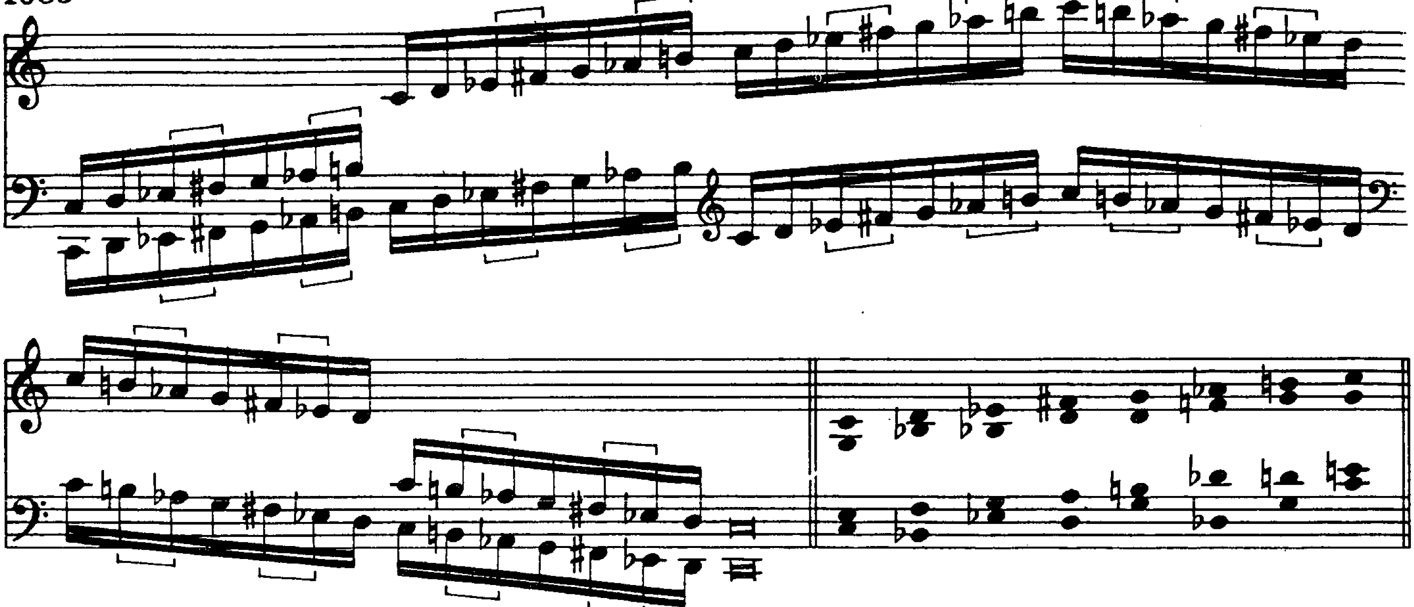


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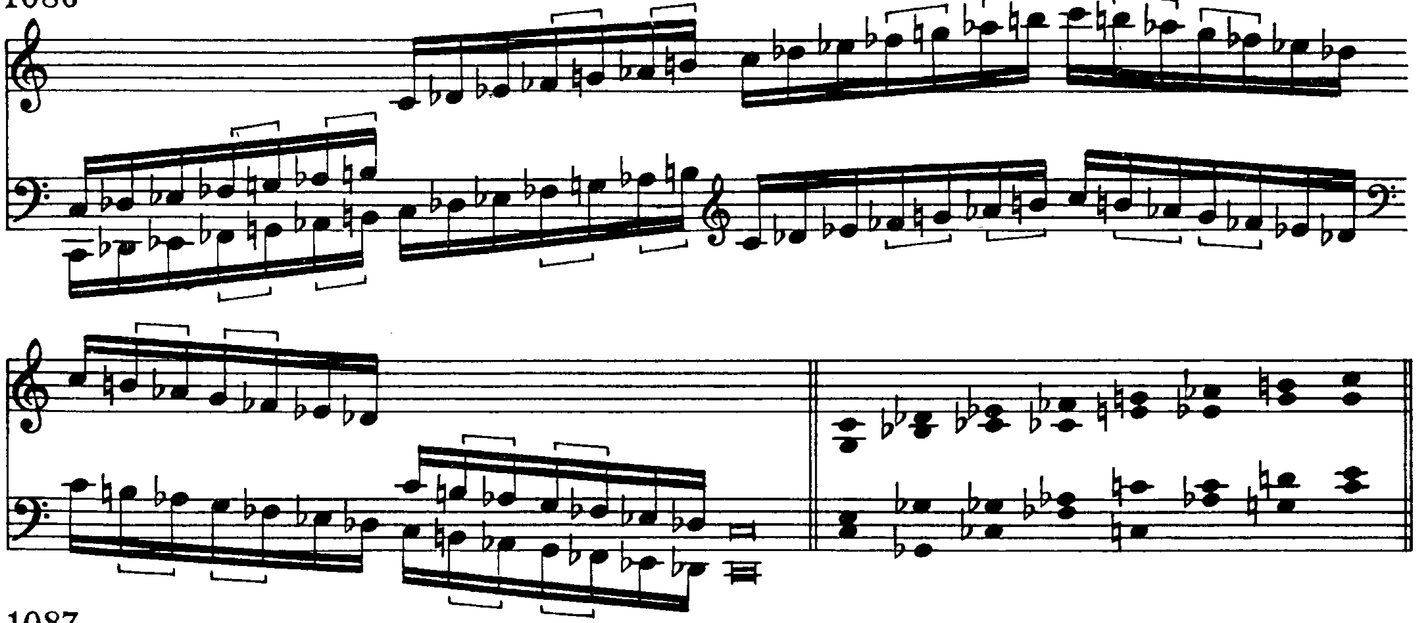


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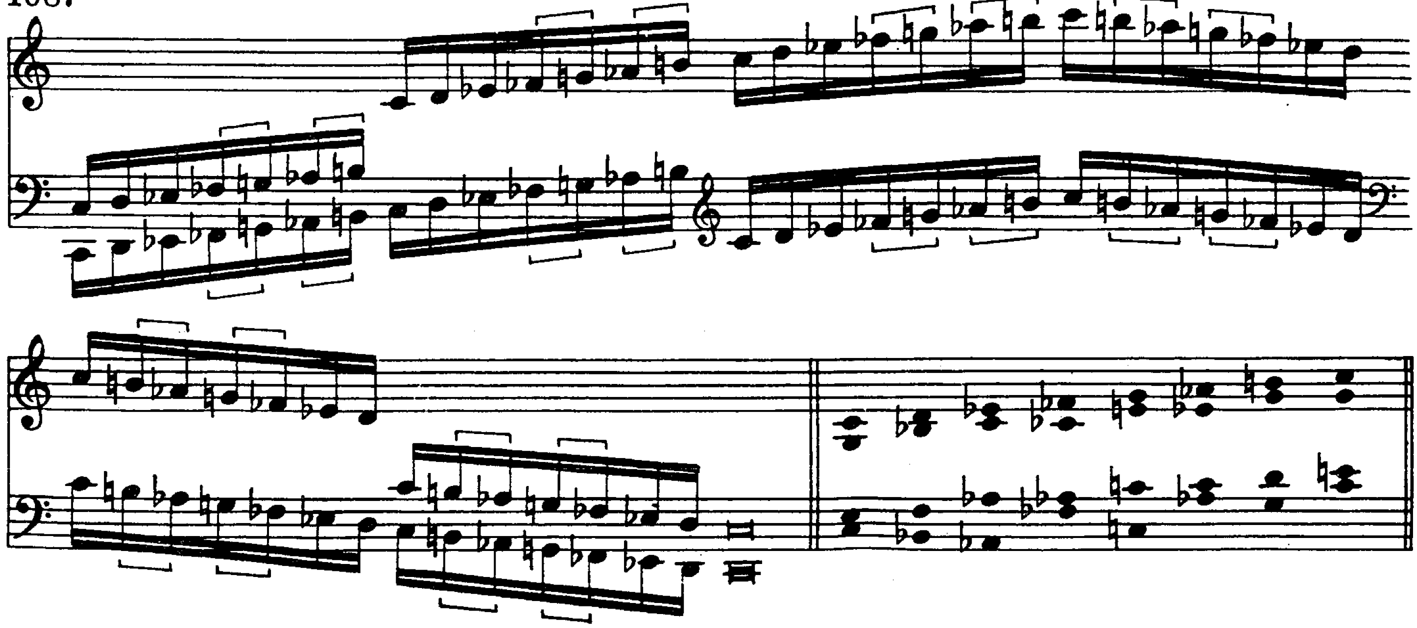


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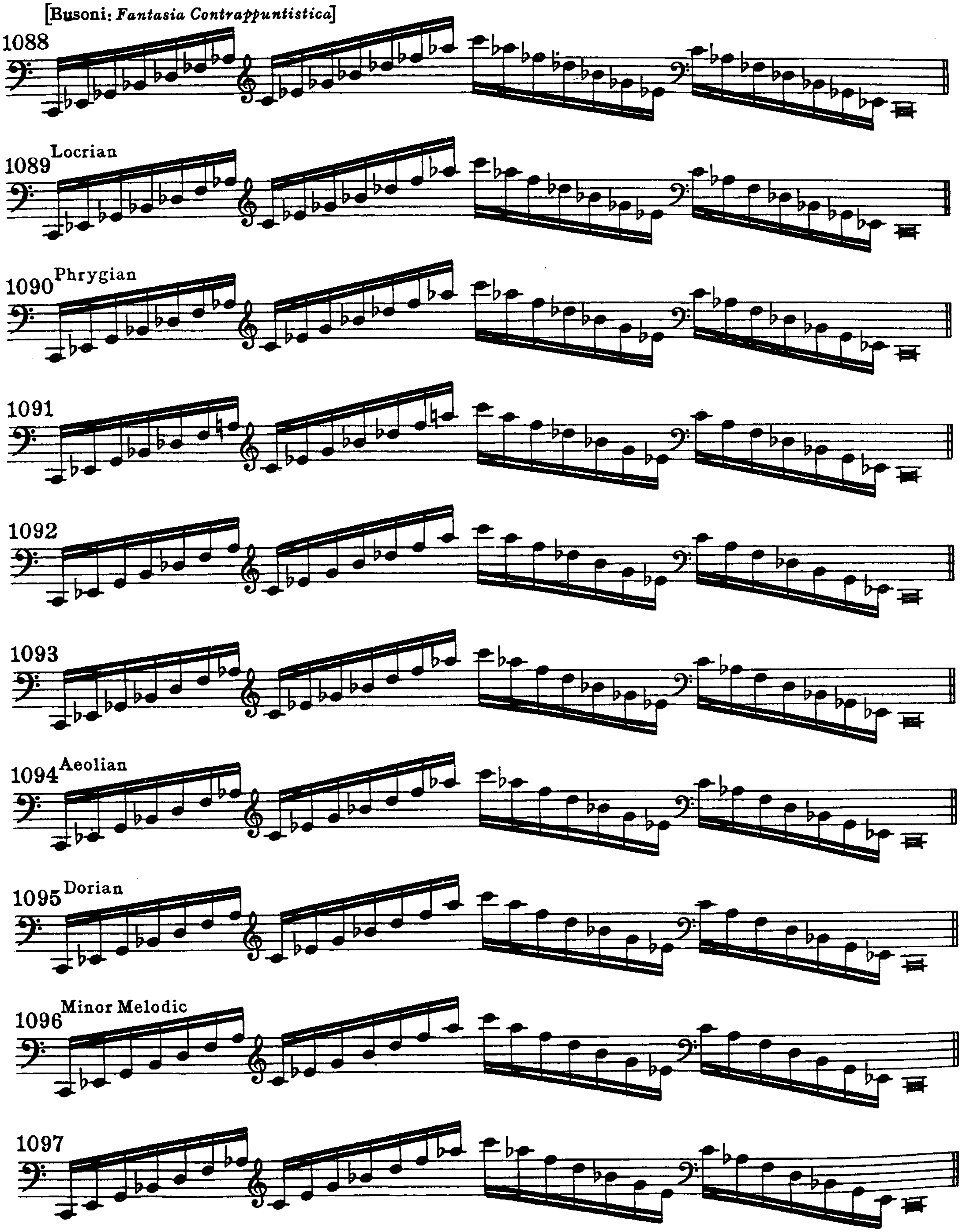
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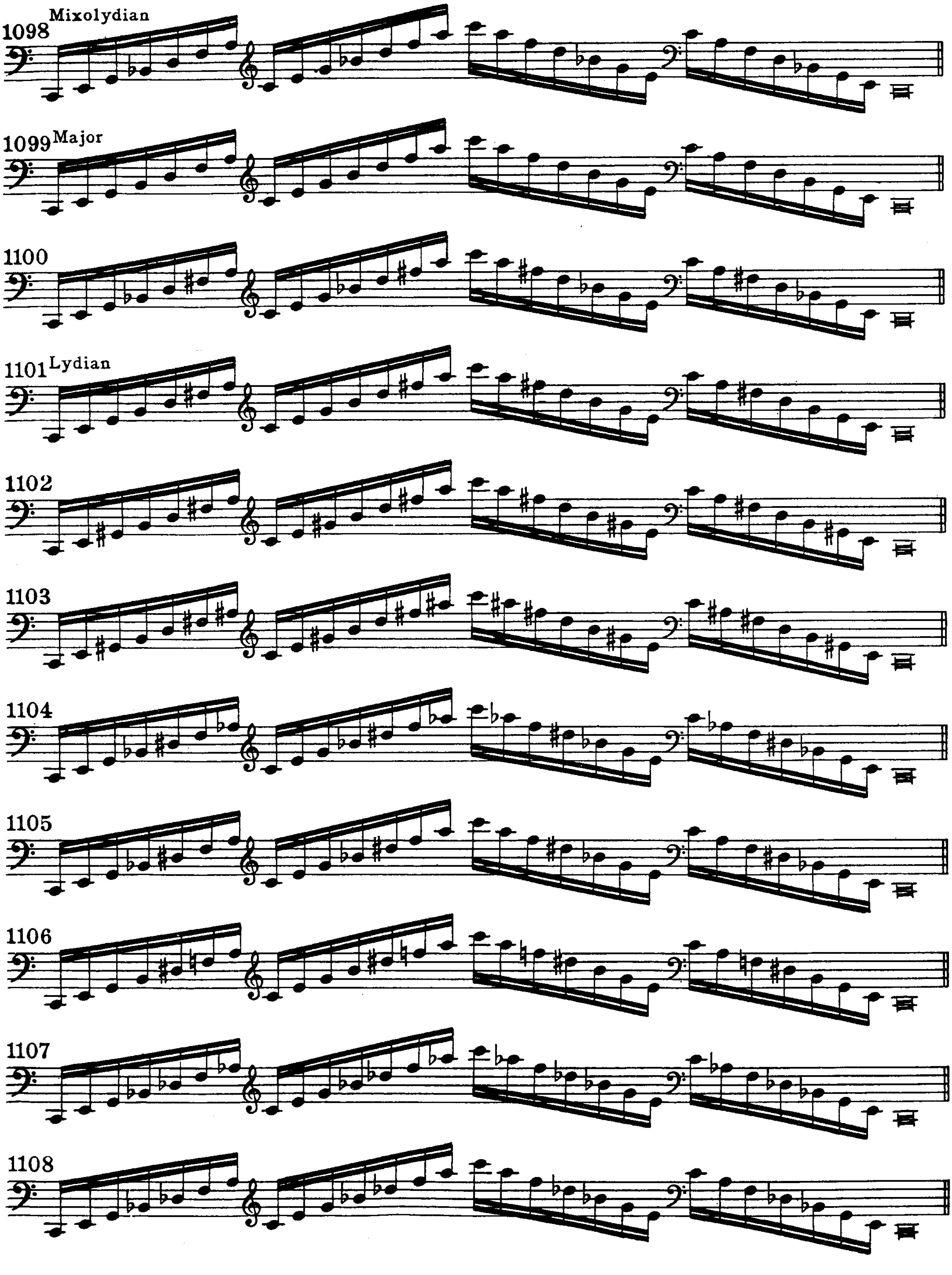


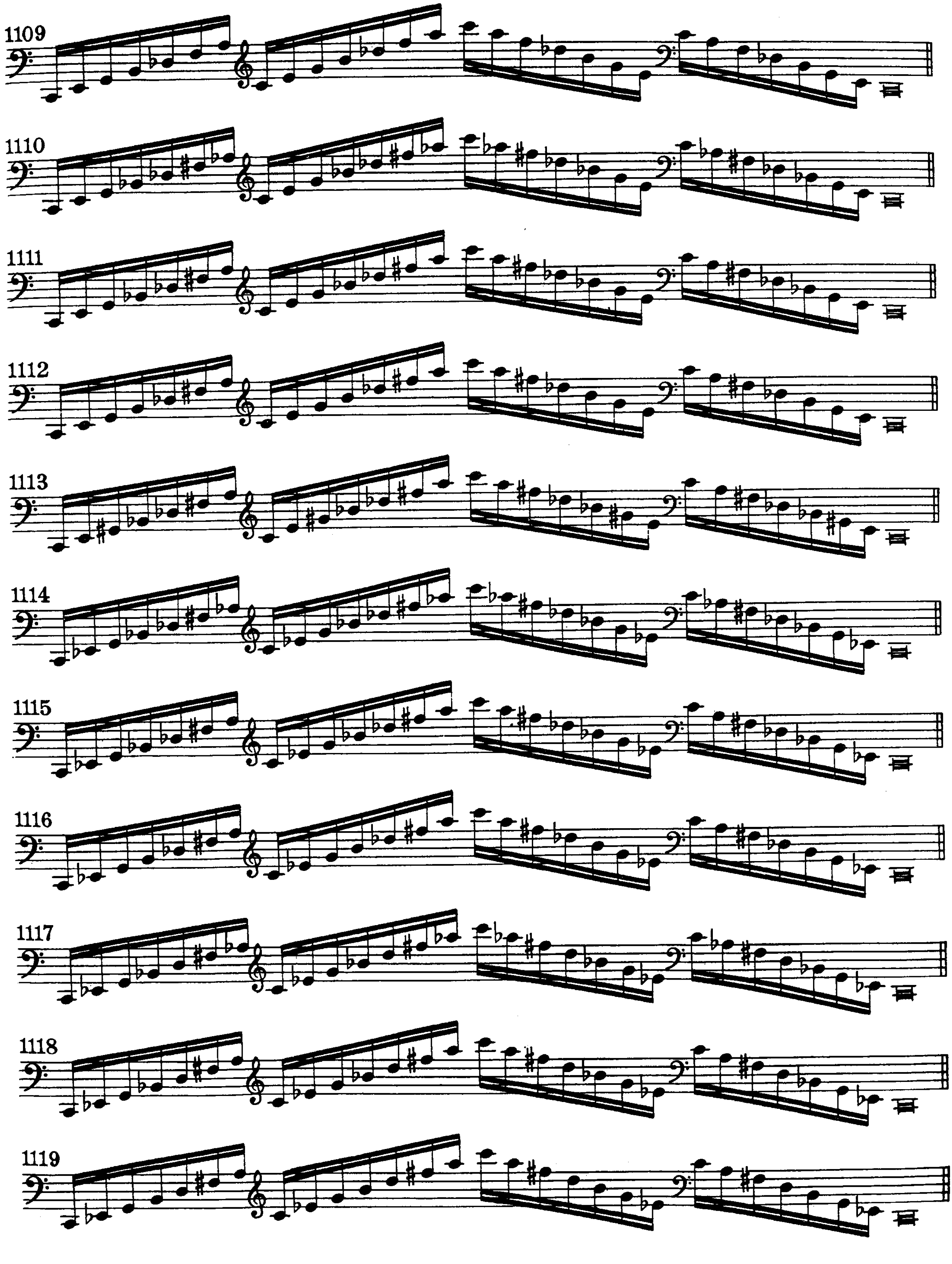
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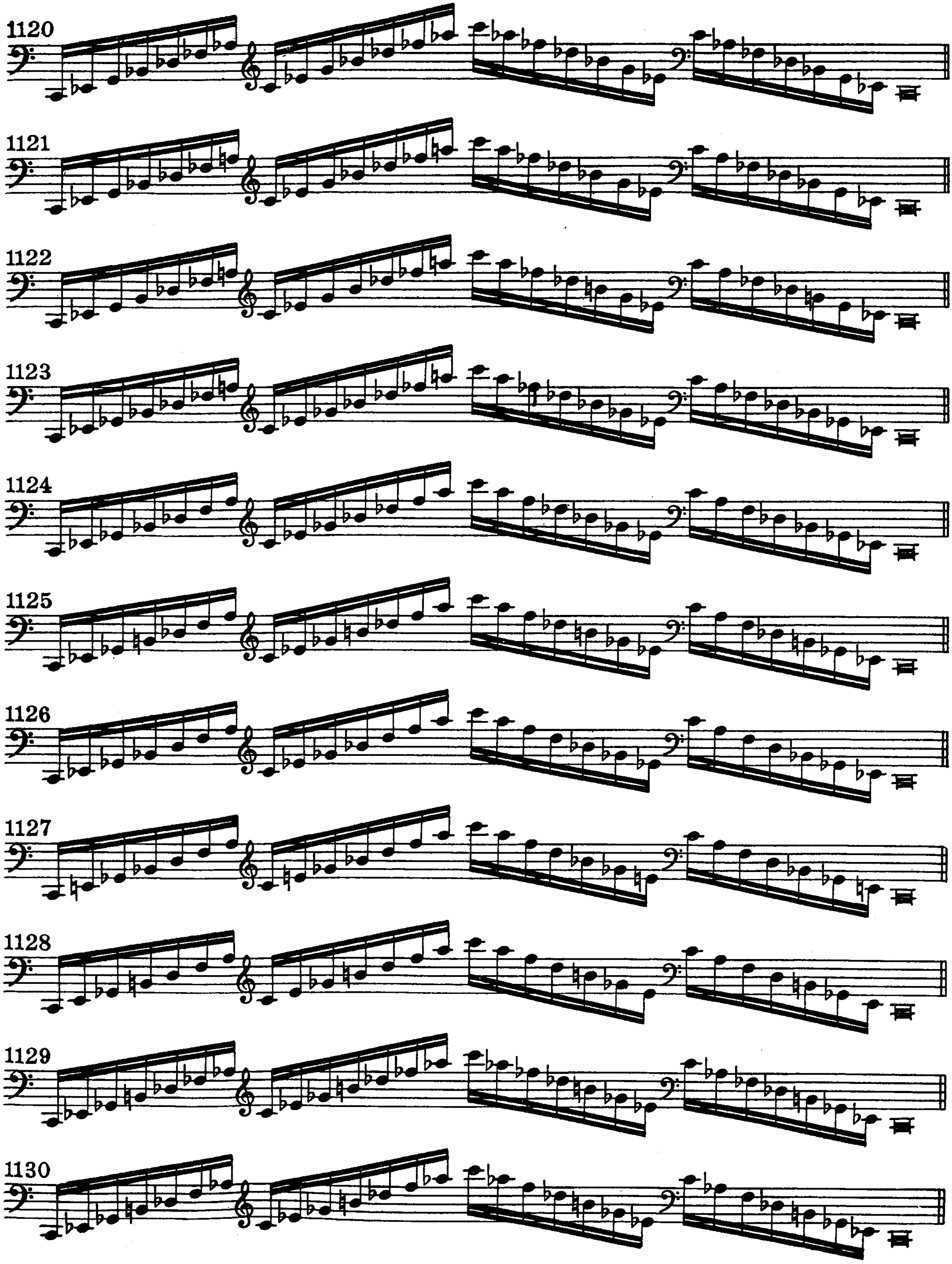


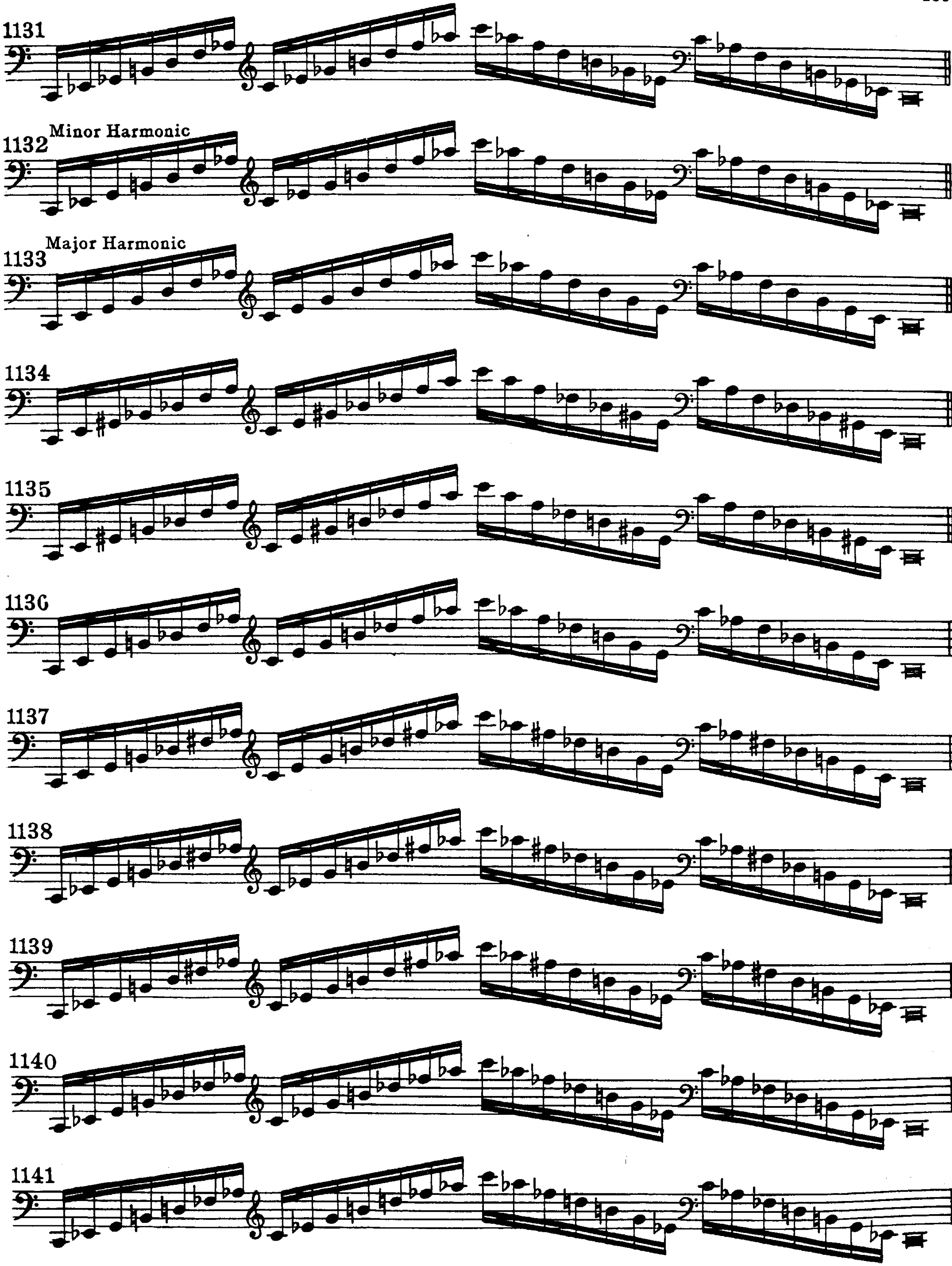
# Heptatonic Arpeggios




1098 Mixolydian
1099 Major
1100
1101 Lydian
1102
1103
1104
1105
1106
1107
1108
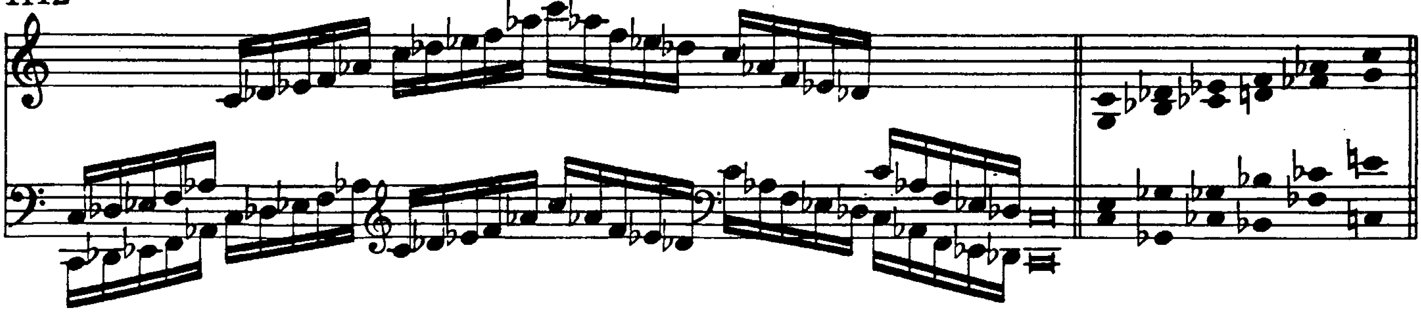

1109
1110
1111
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1120
1121
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1123
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1128
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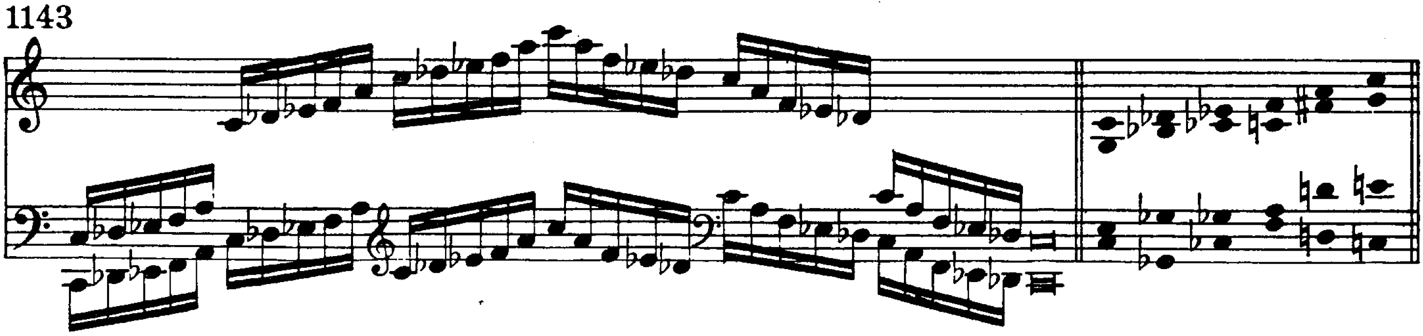

1131
Minor Harmonic
1132
Major Harmonic
1133
1134
1135
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1141

# Pentatonic Scales
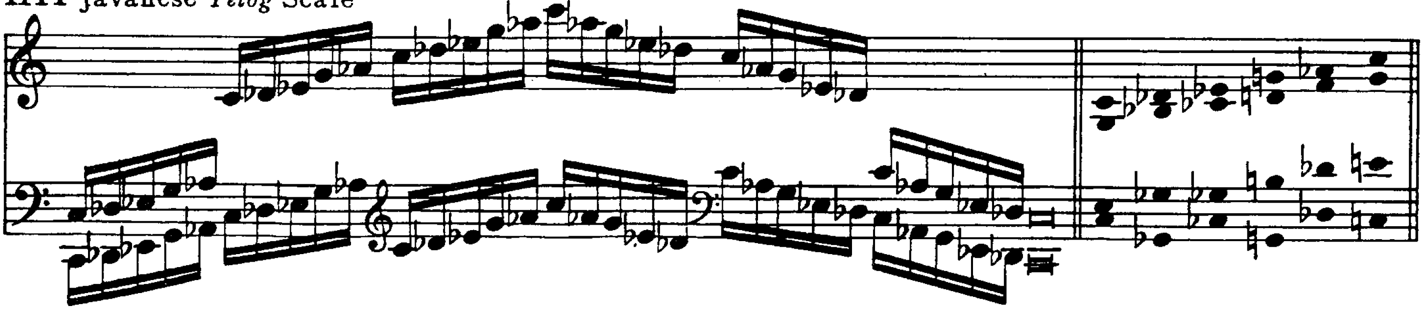
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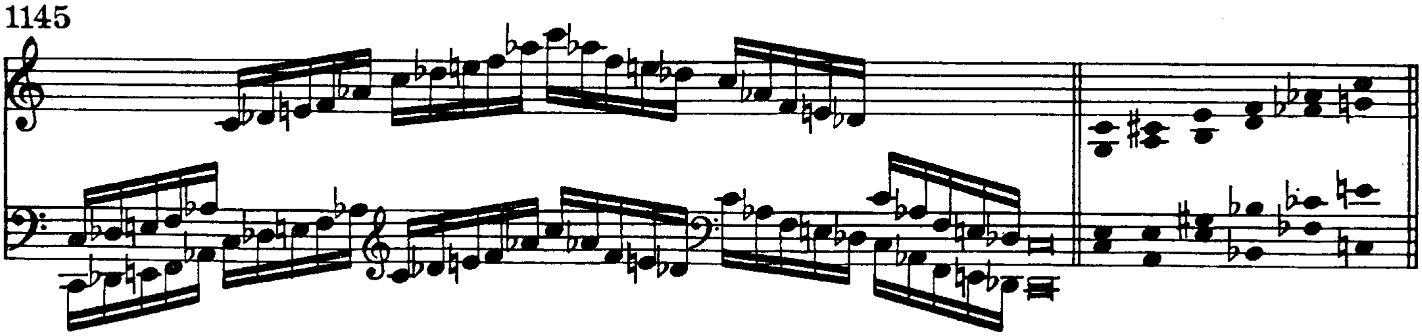


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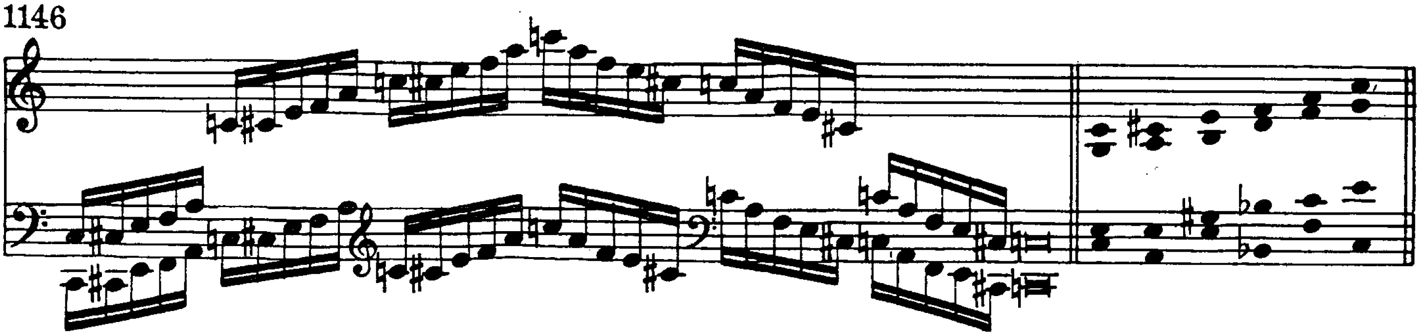
1144 Javanese *Pelog* Scale
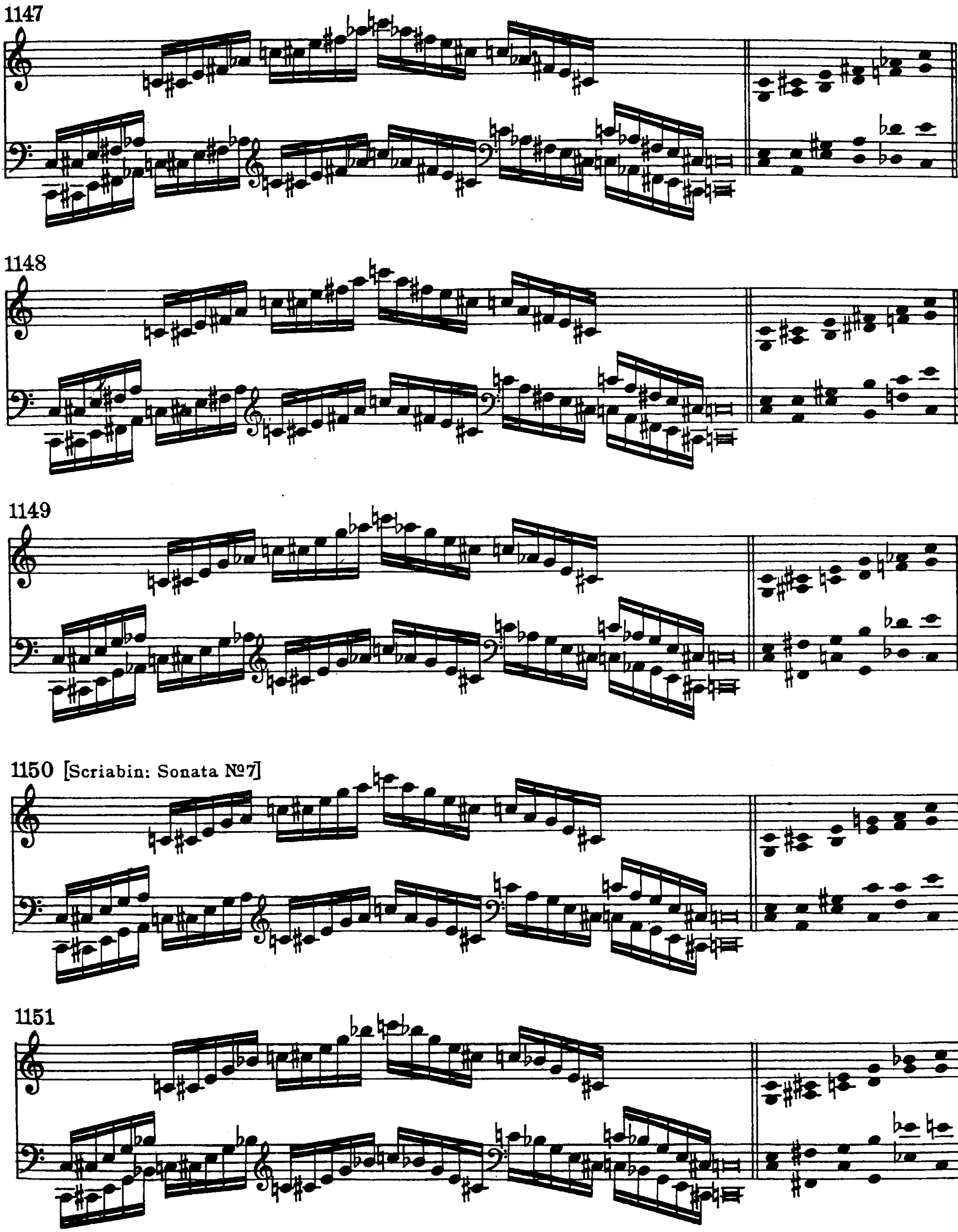


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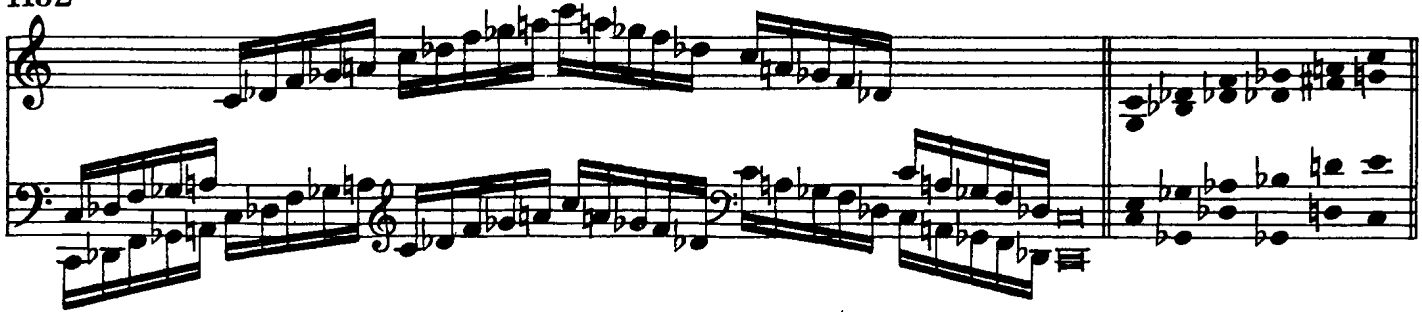


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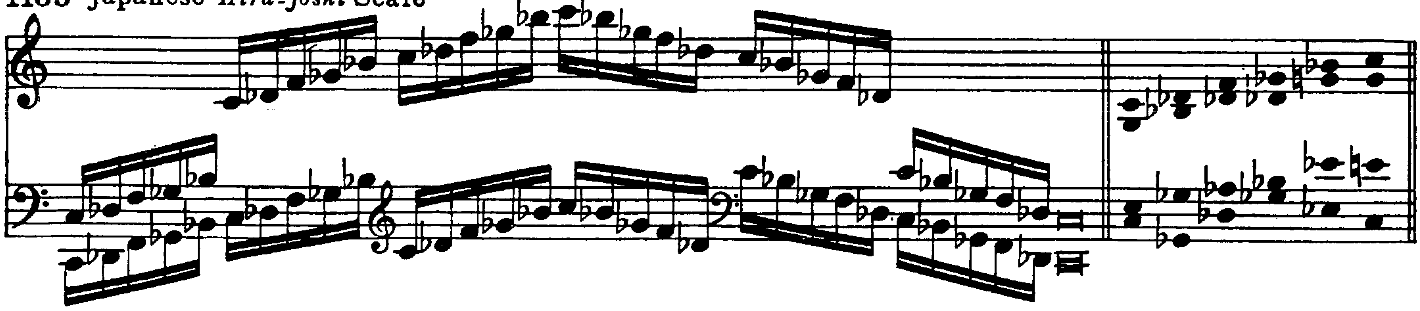



1147
1148
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1150 [Scriabin: Sonata №7]
1151
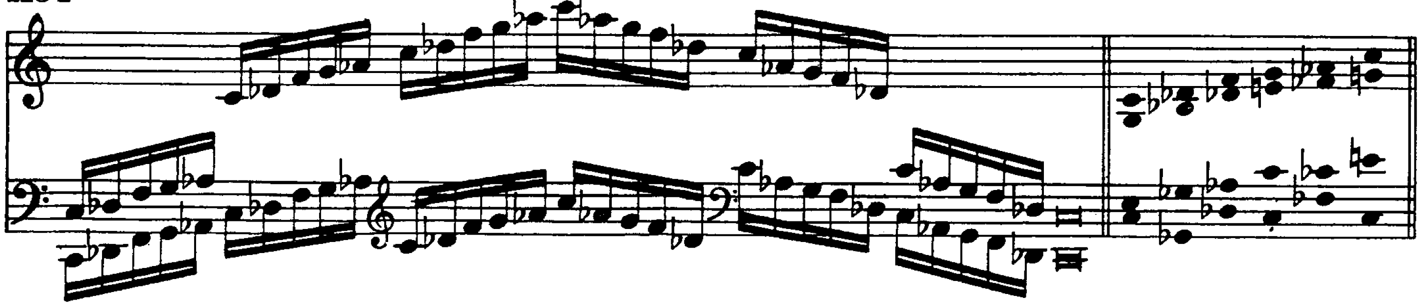
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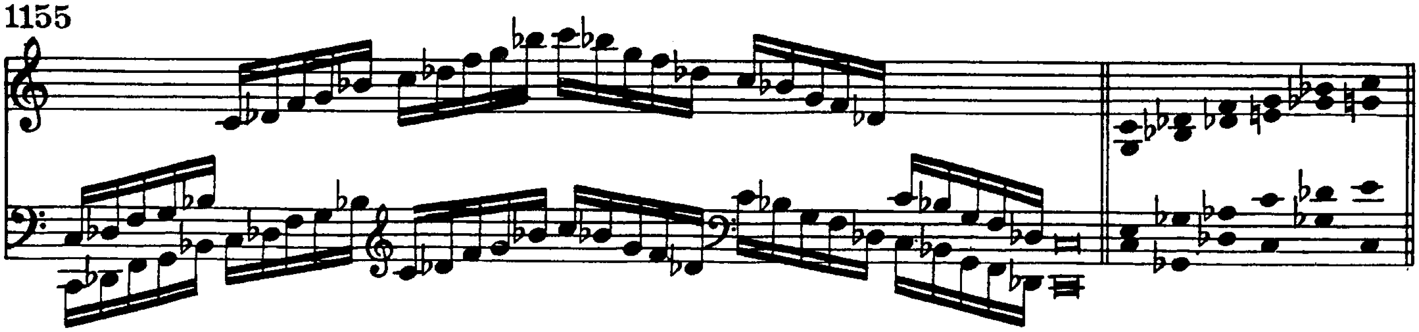


1153 Japanese *Hira-Joshi* Scale
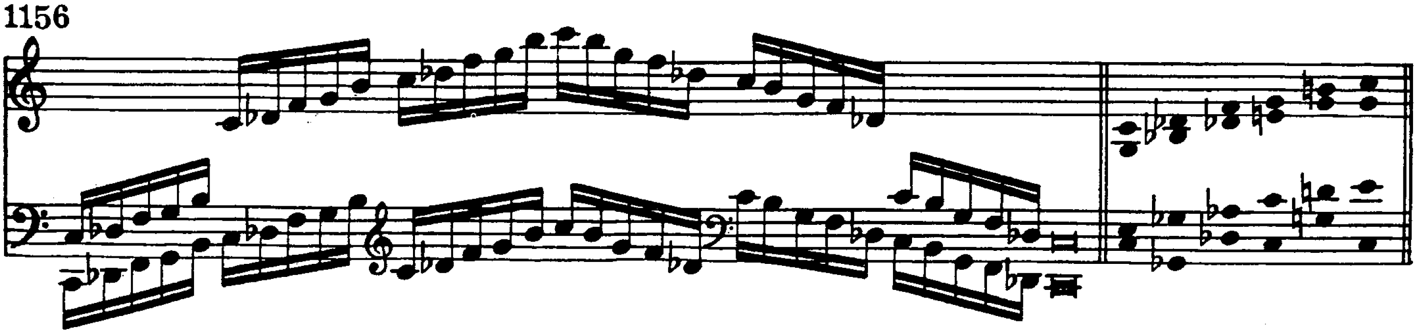


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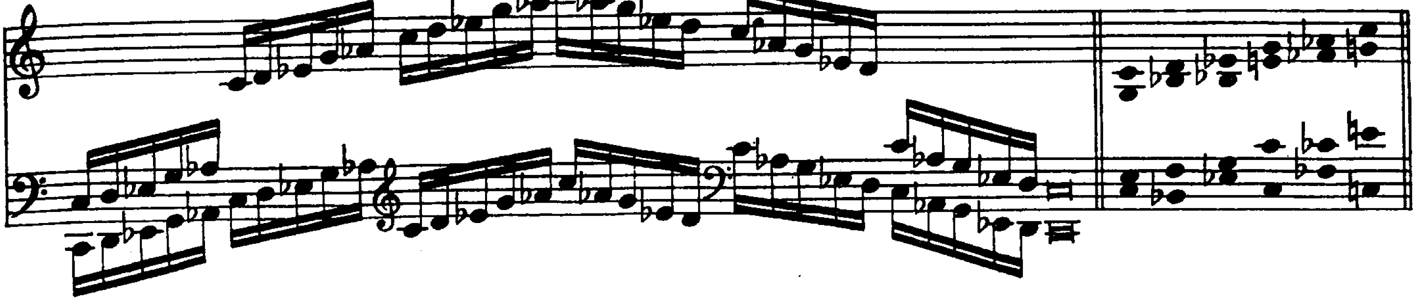
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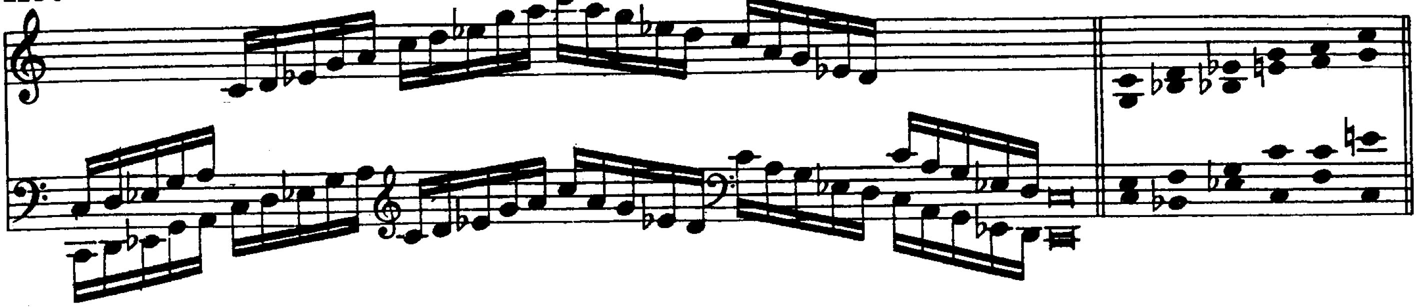


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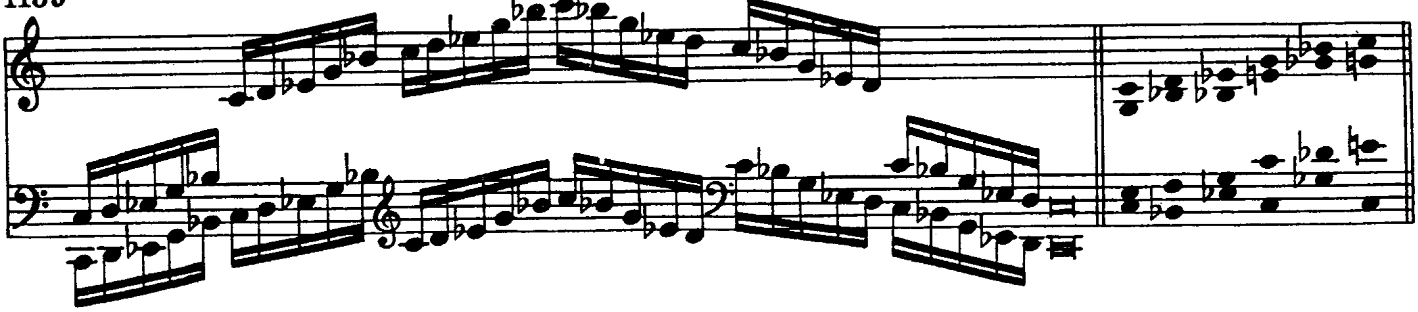


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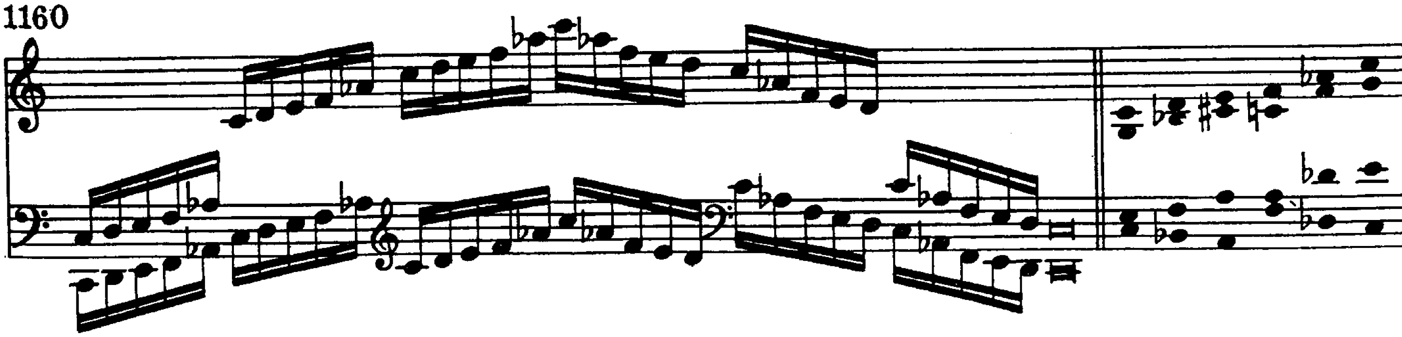


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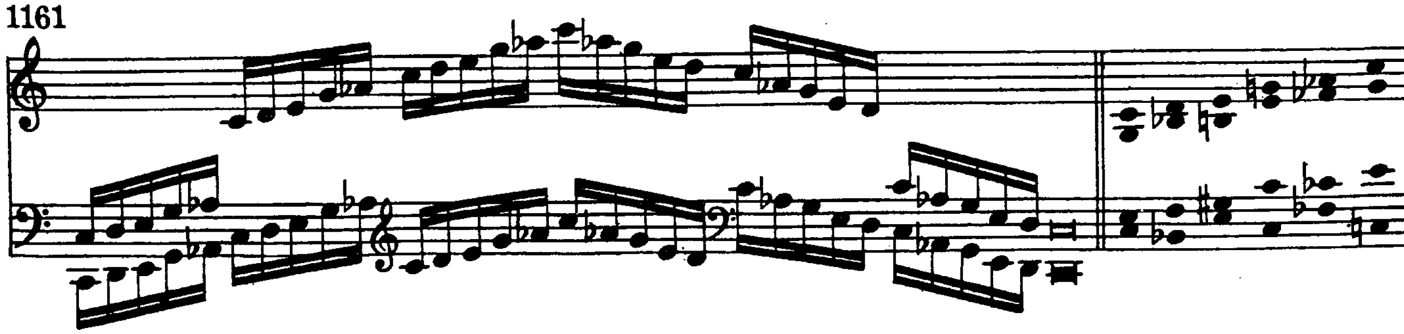


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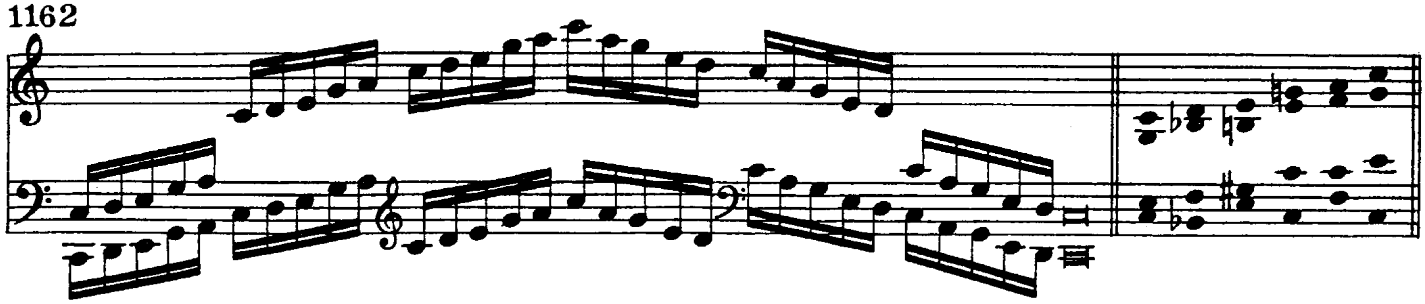
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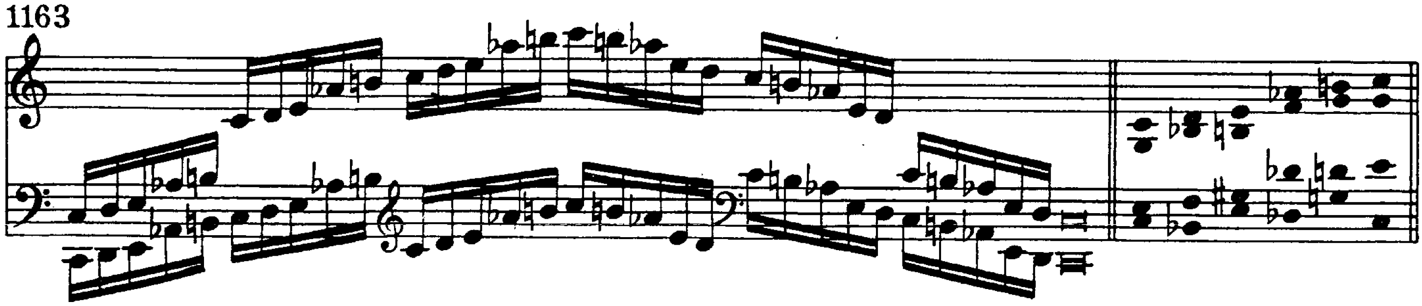


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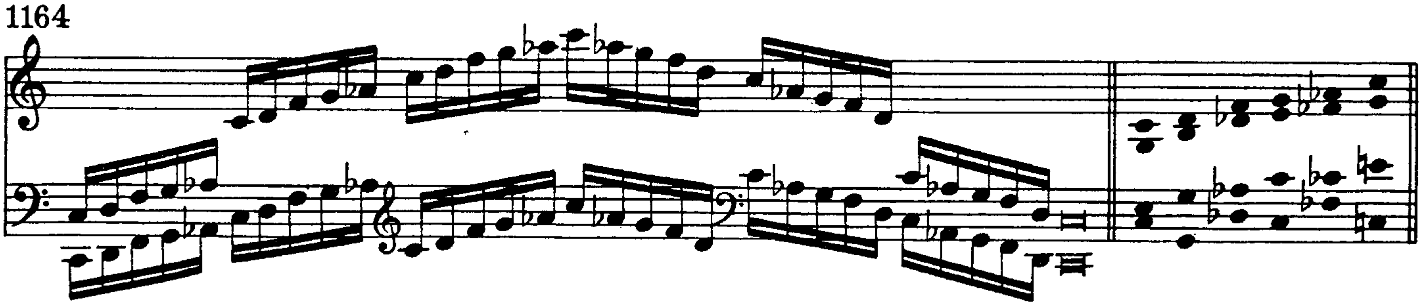


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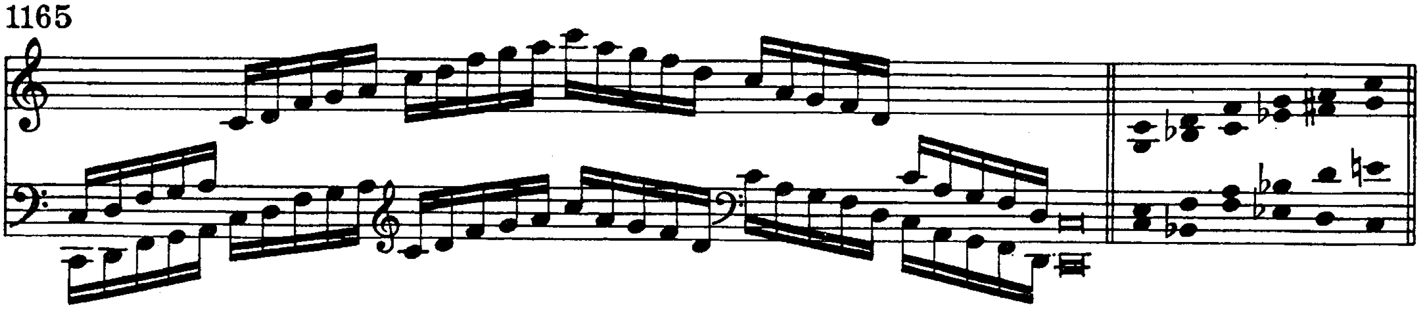


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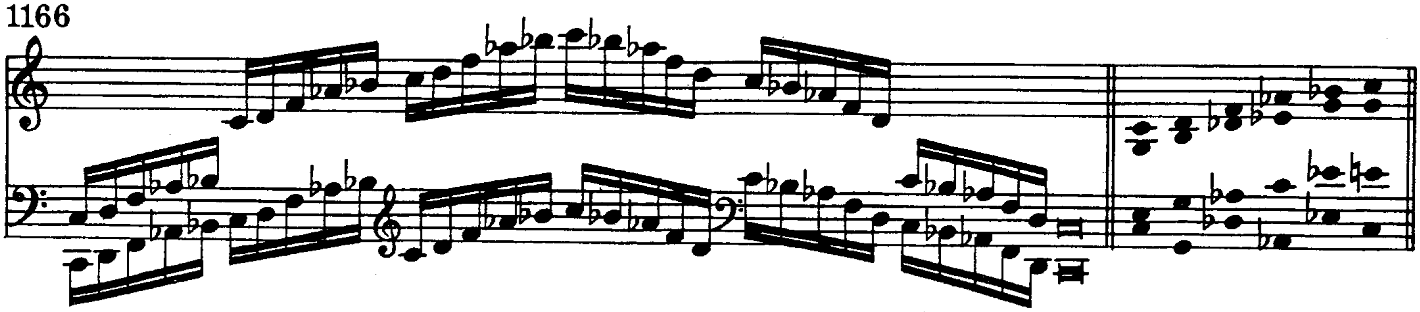


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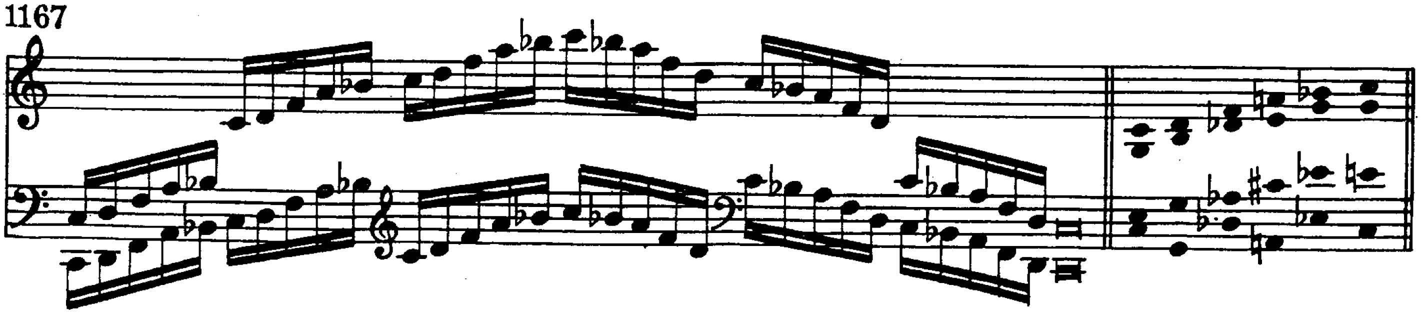


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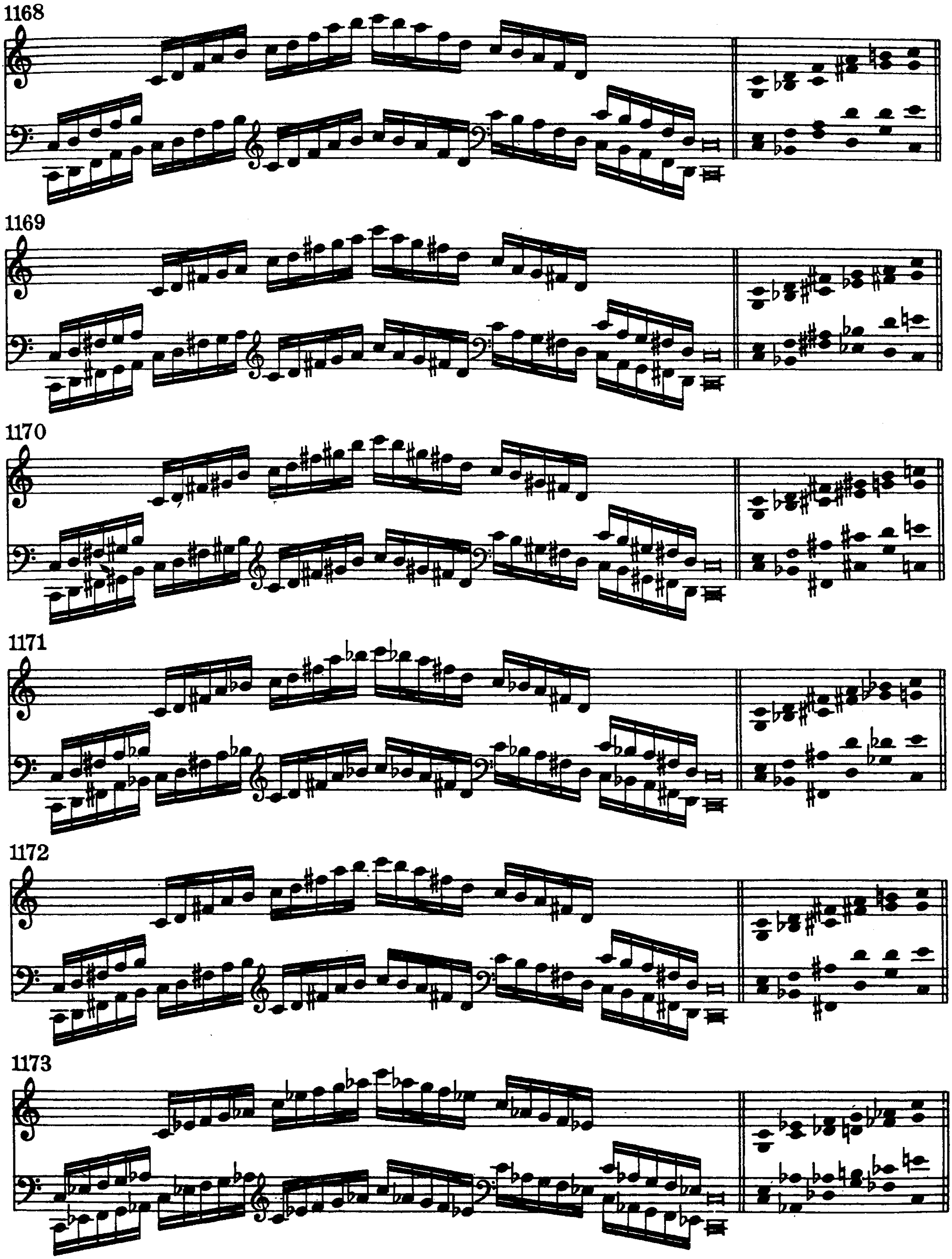


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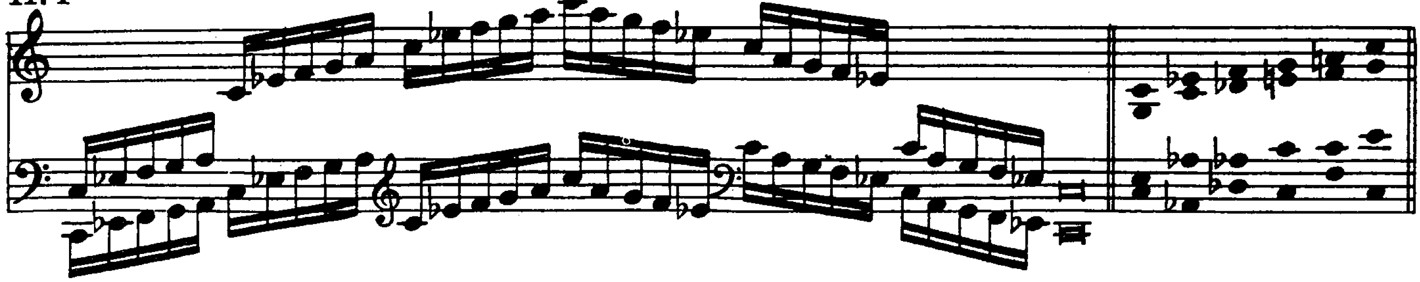


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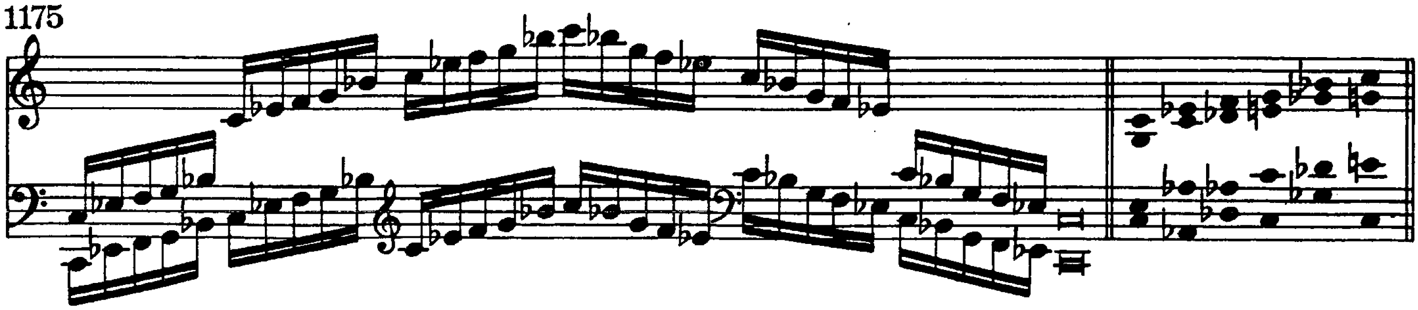



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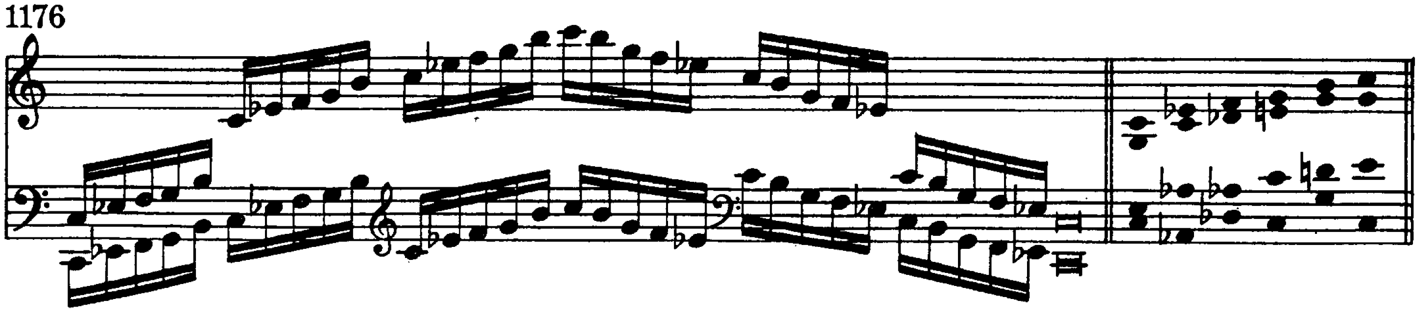
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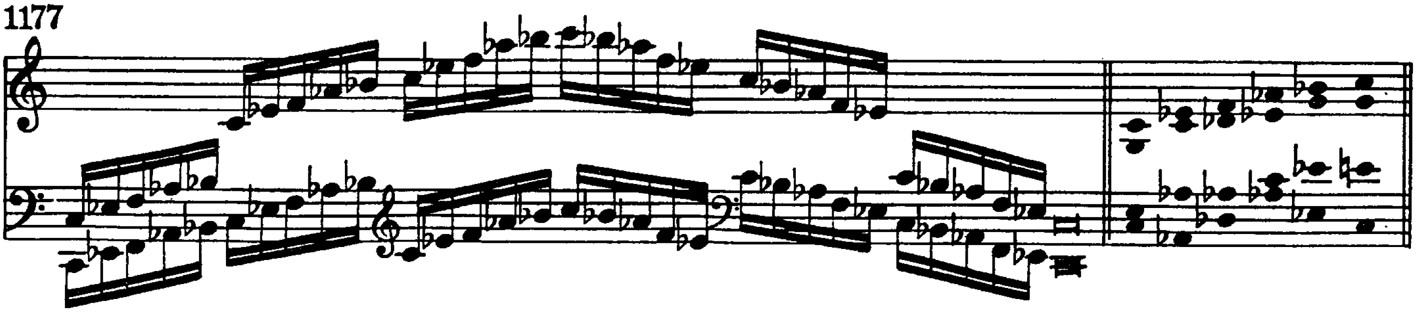


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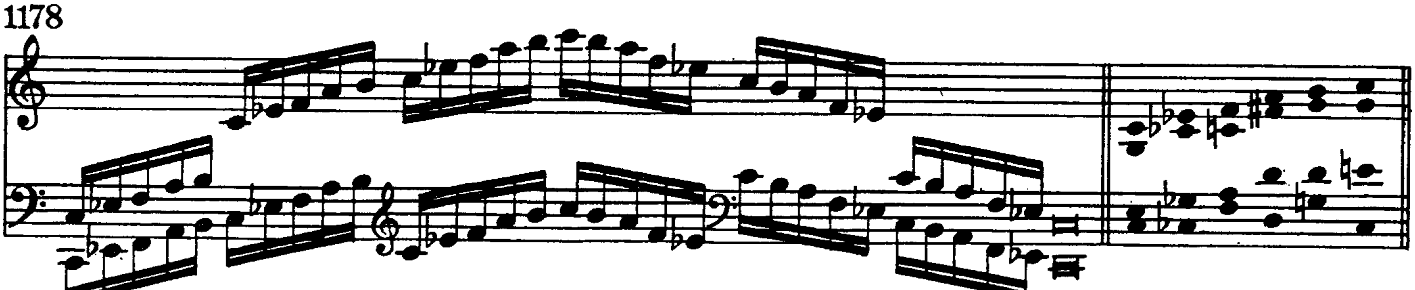


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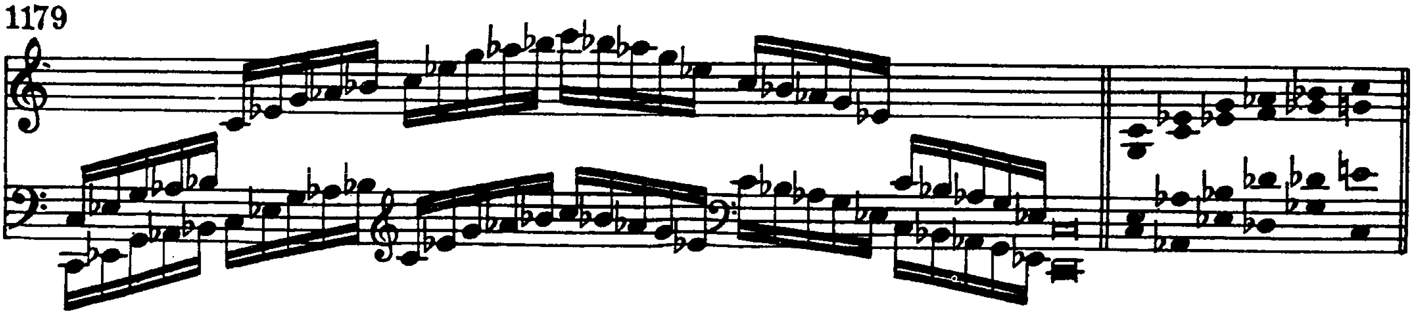


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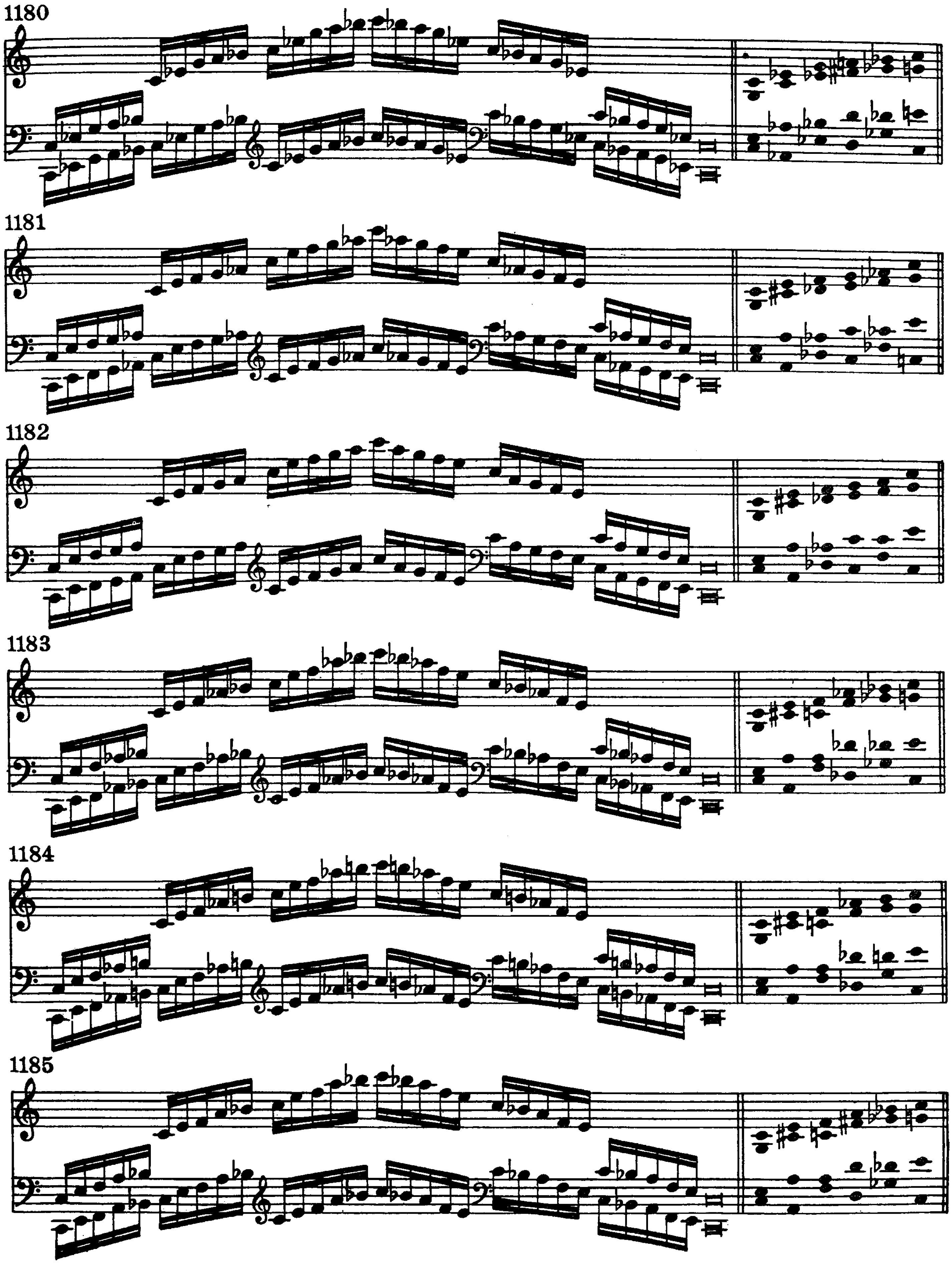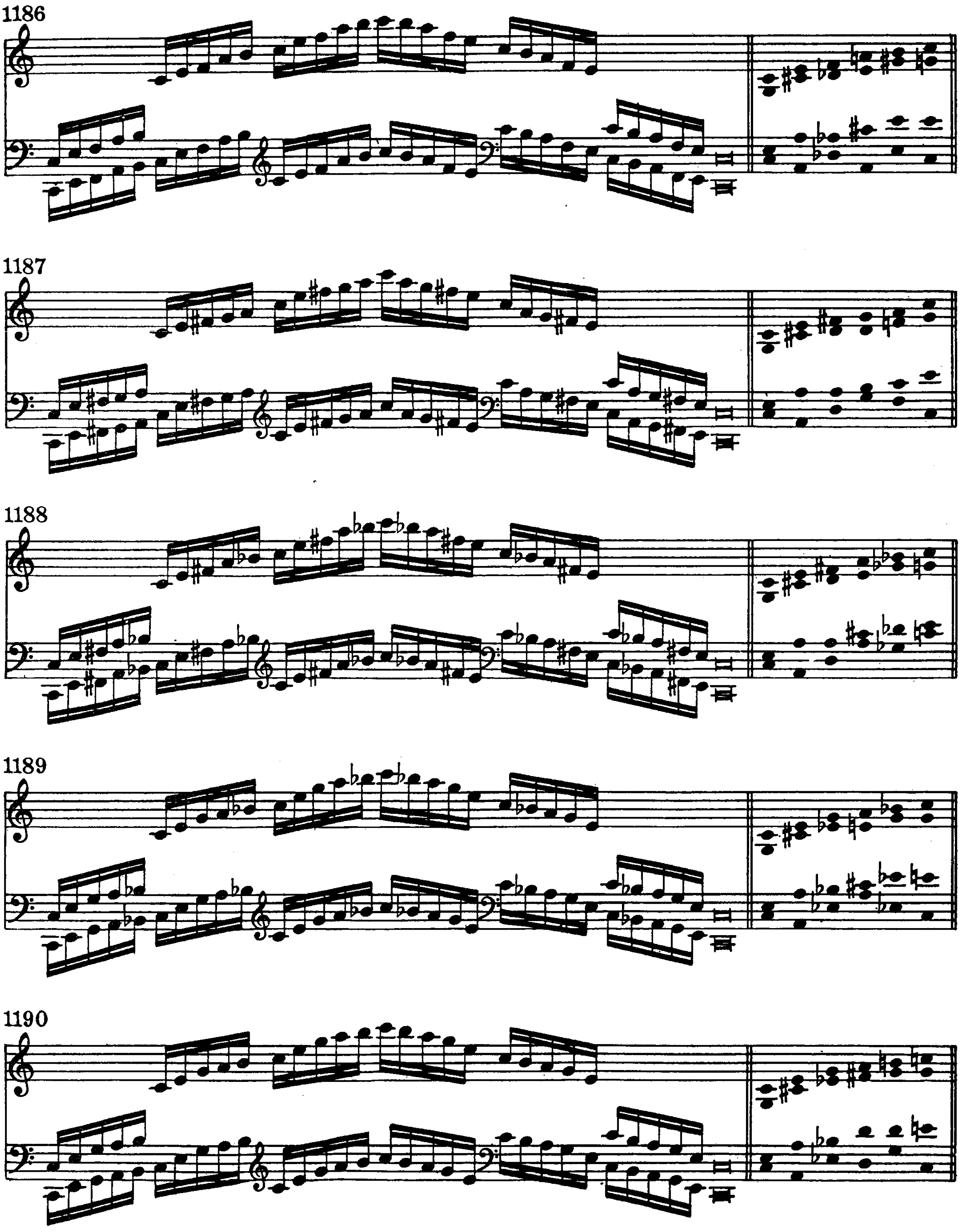


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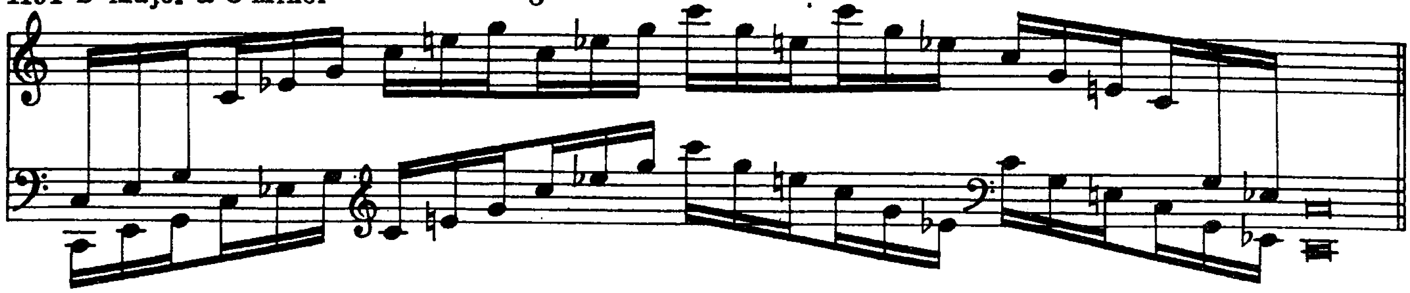



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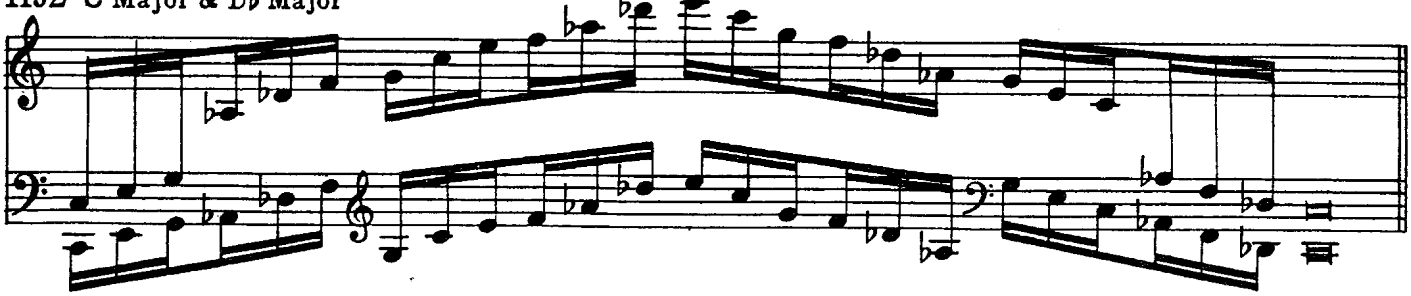

1186
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1190

# Bitonal Arpeggios
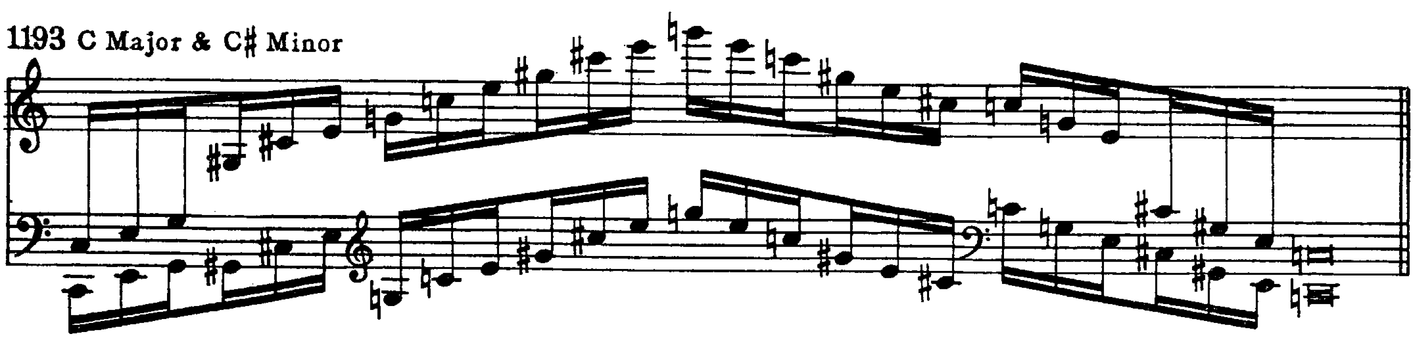
1191 C Major & C Minor



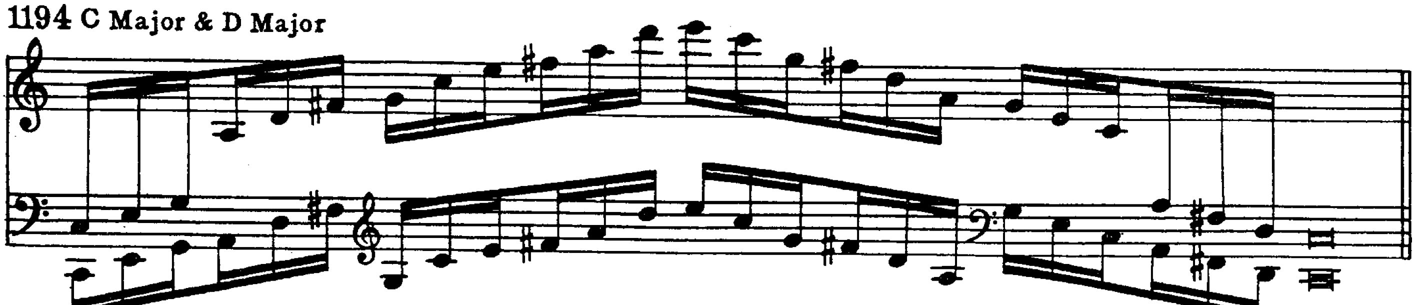
1192 C Major & D♭ Major



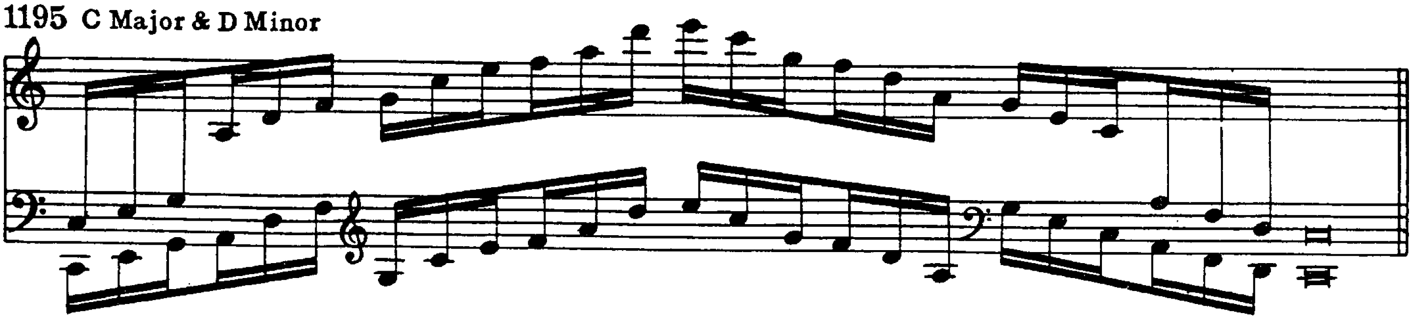
1193 C Major & C♯ Minor



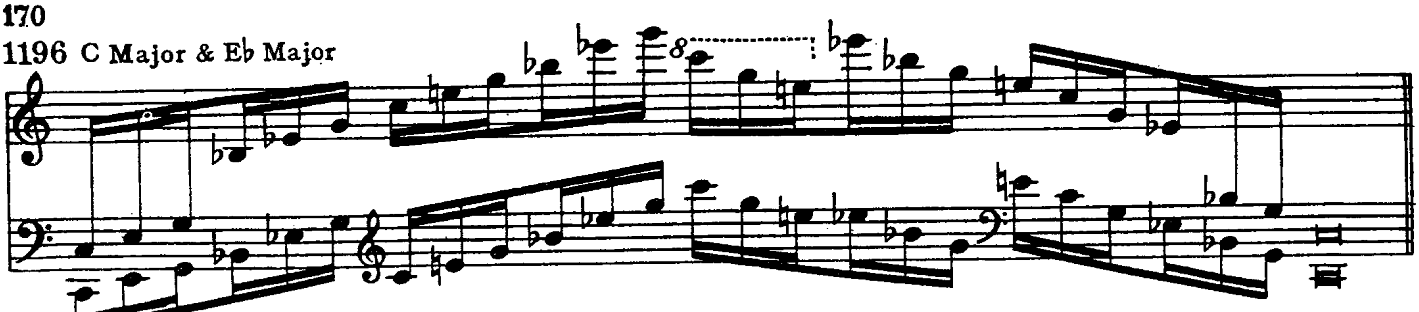
1194 C Major & D Major
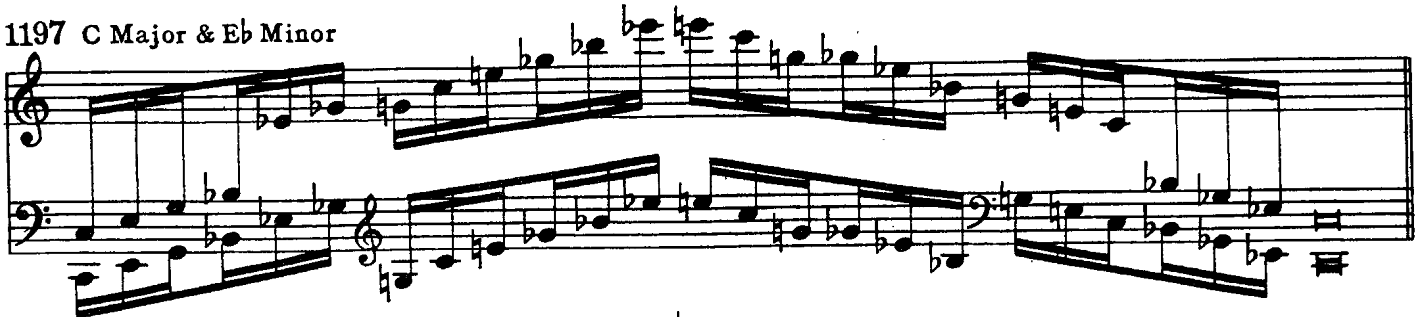


1195 C Major & D Minor
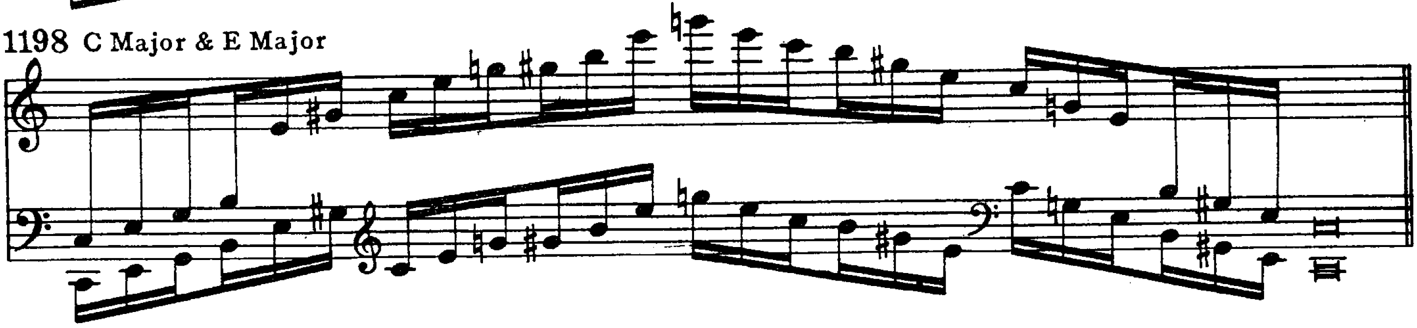


1196 C Major & E♭ Major
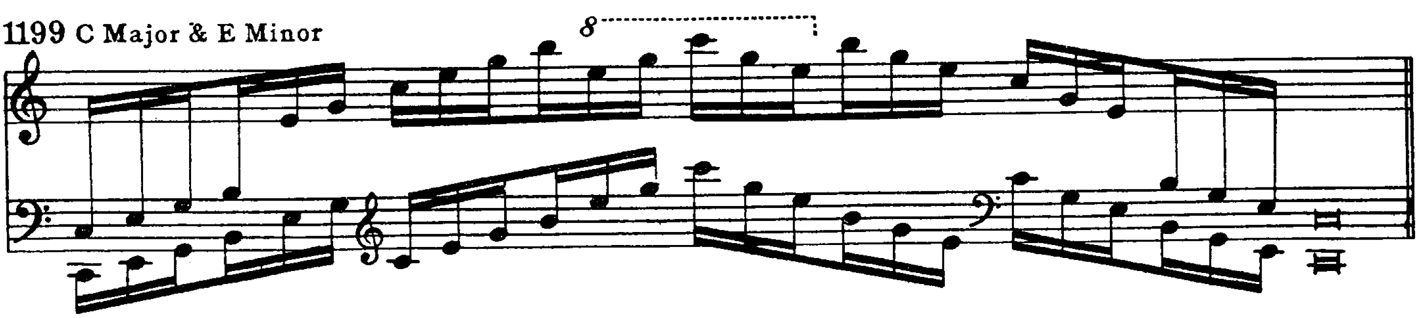


1197 C Major & E♭ Minor
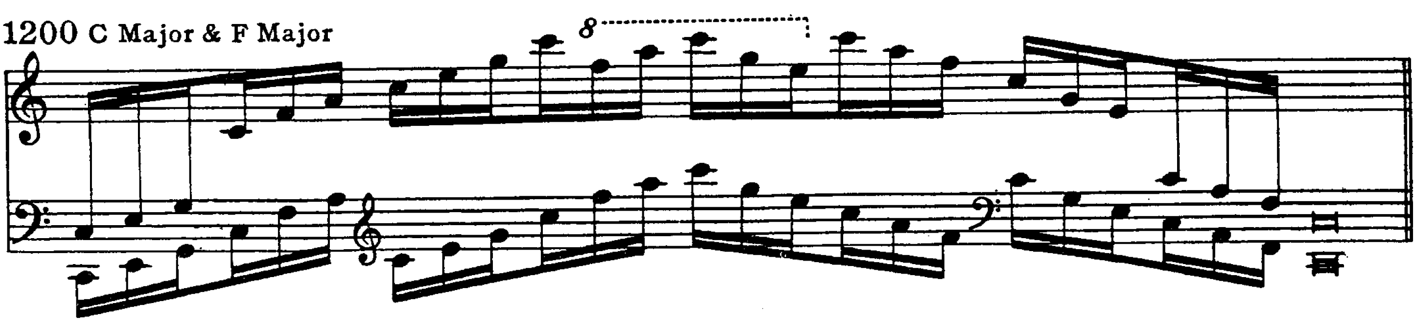


1198 C Major & E Major



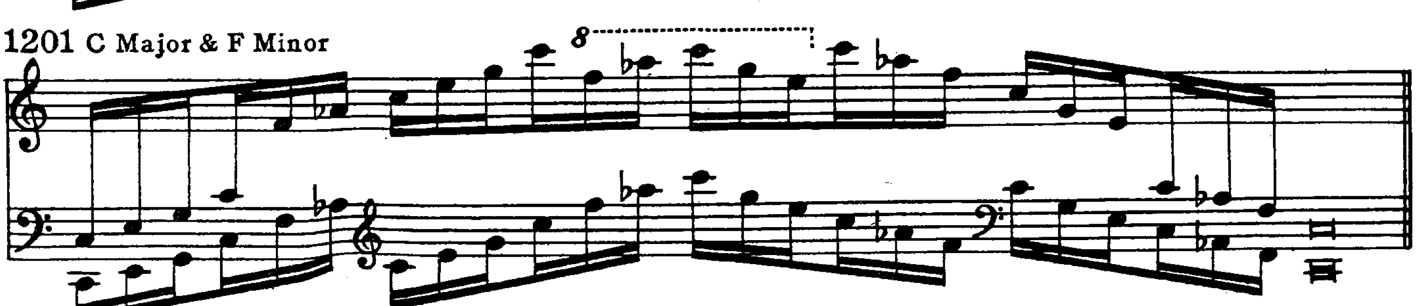
1199 C Major & E Minor
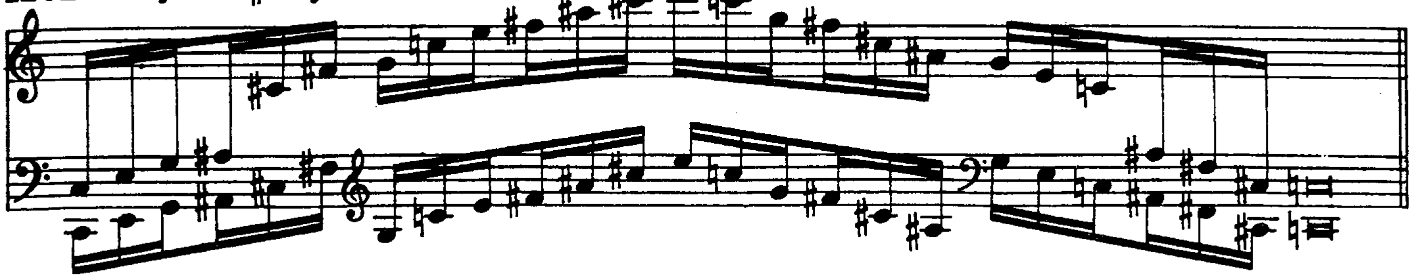


1200 C Major & F Major
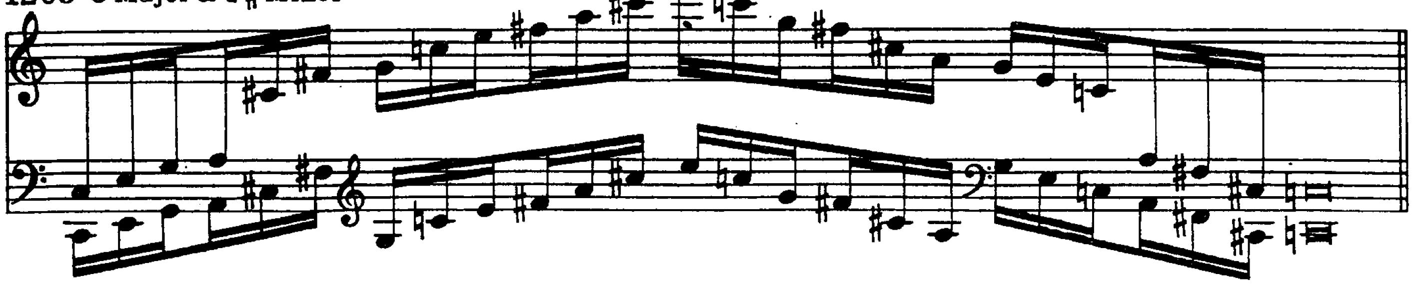


1201 C Major & F Minor
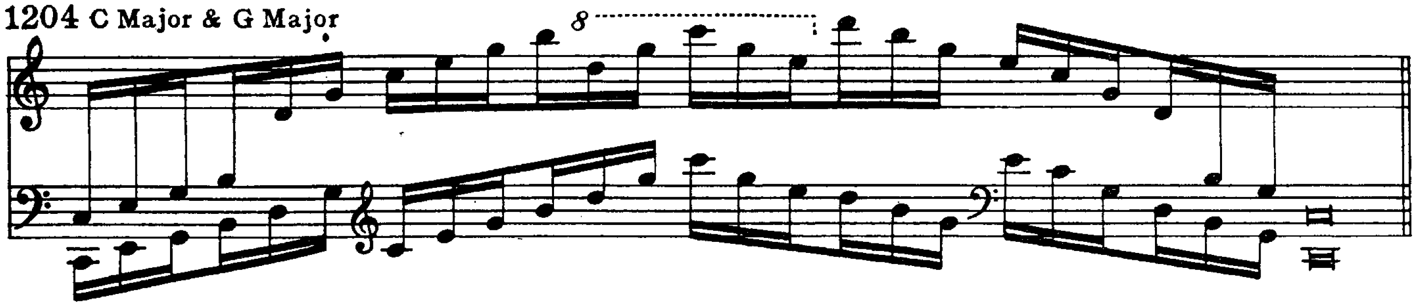


1202 C Major & F♯ Major
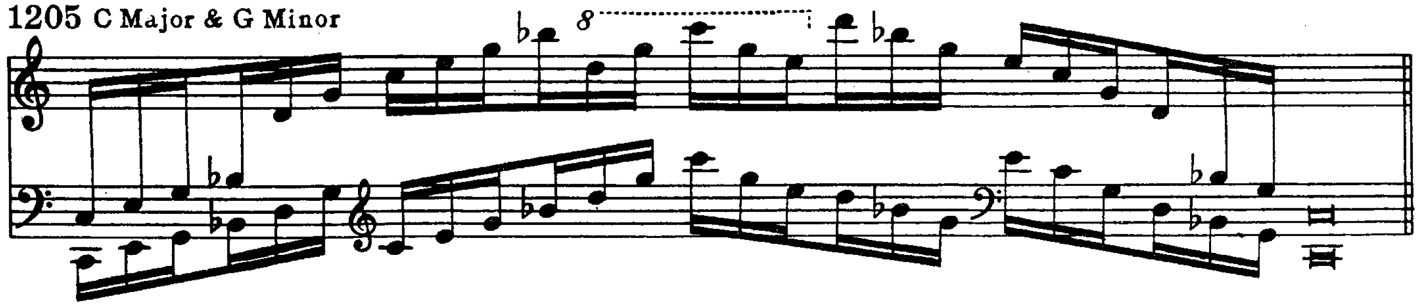


1203 C Major & F♯ Minor
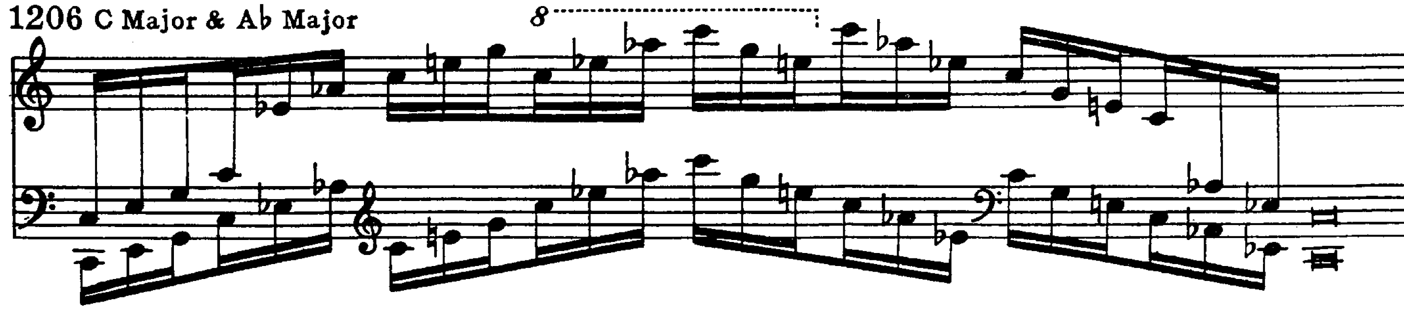


1204 C Major & G Major
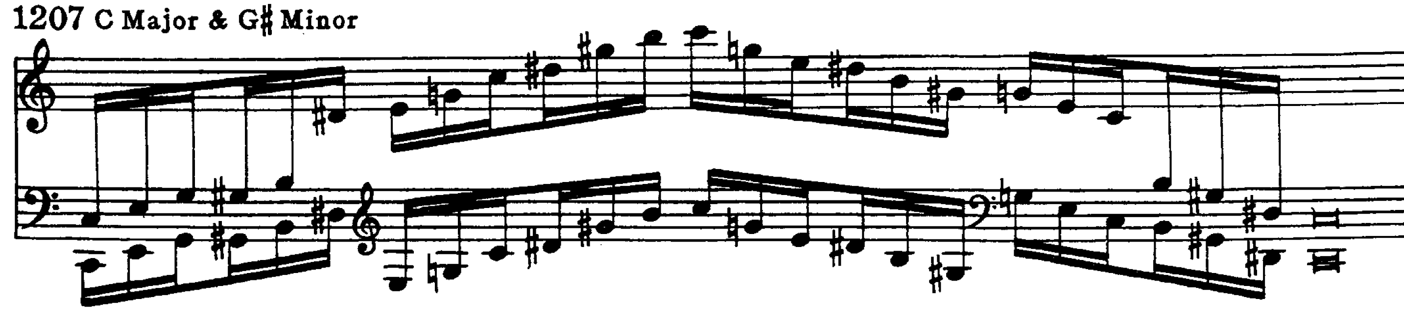



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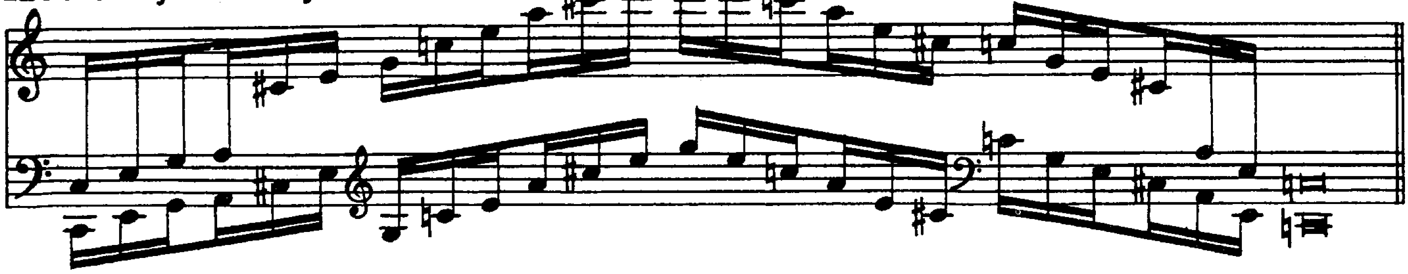



1206 C Major & A♭ Major
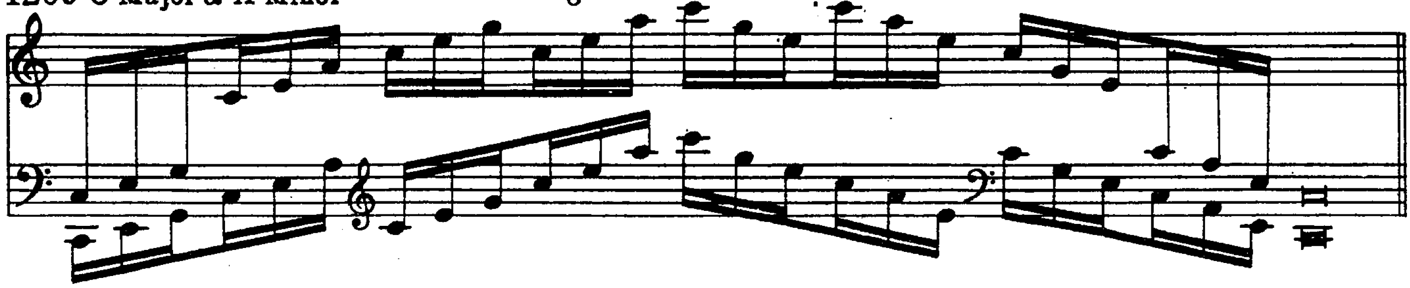



1207 C Major & G♯ Minor
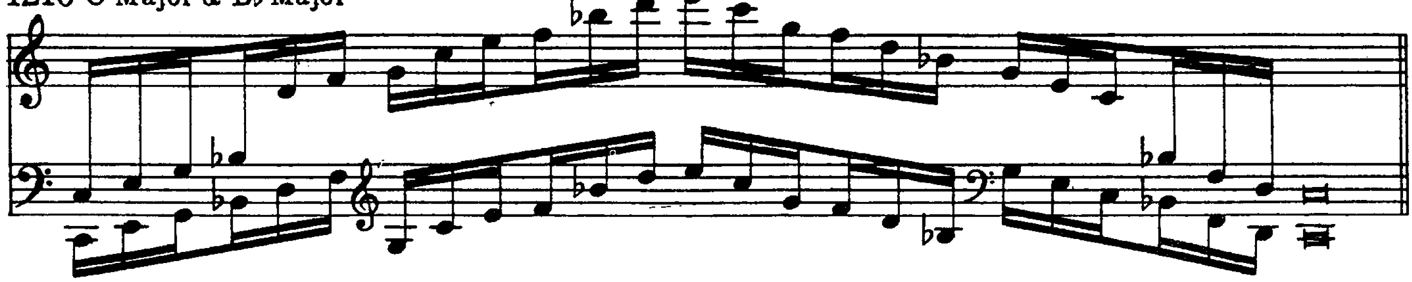


1208 C Major & A Major
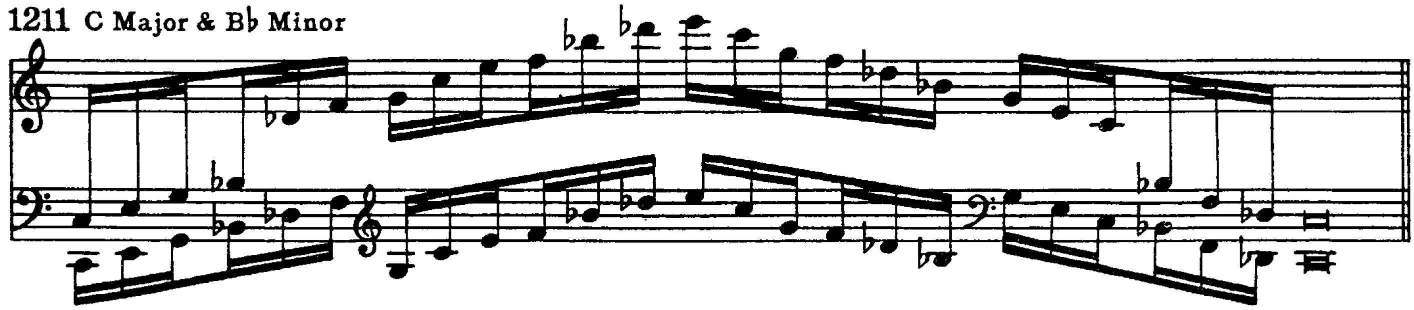


1209 C Major & A Minor



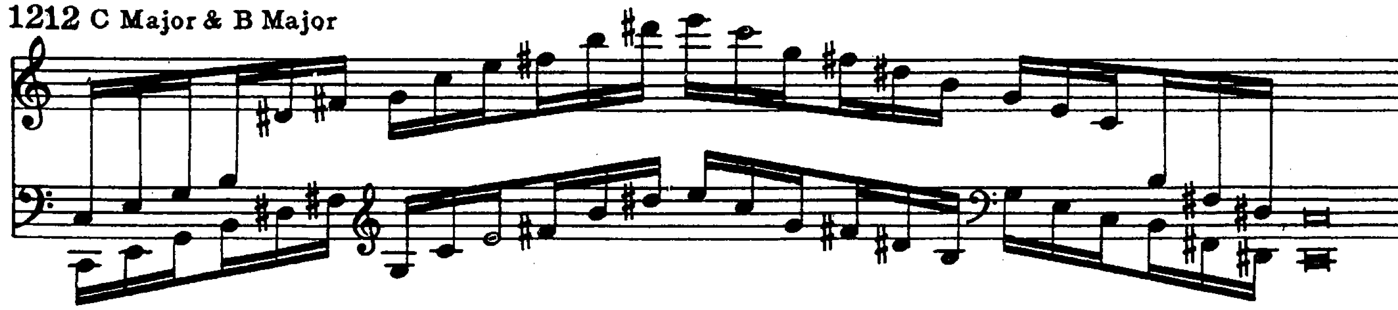
1210 C Major & B♭ Major
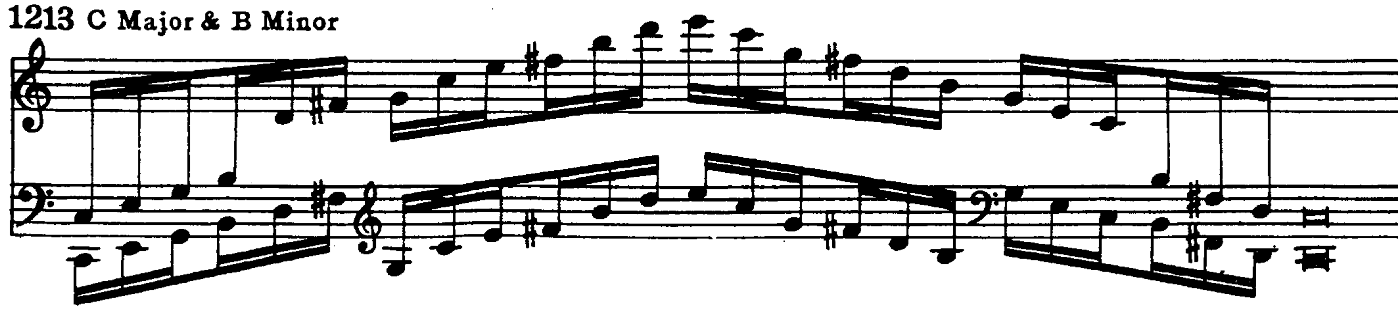


1211 C Major & B♭ Minor



1212 C Major & B Major



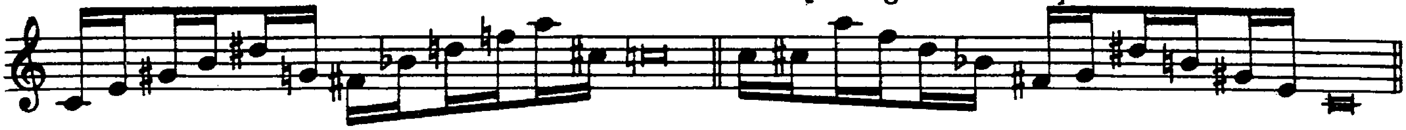
1213 C Major & B Minor



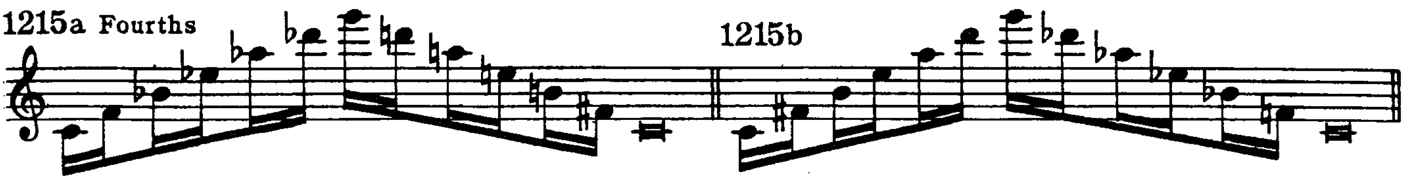
# Twelve-Tone Patterns

## Dodecaphonic

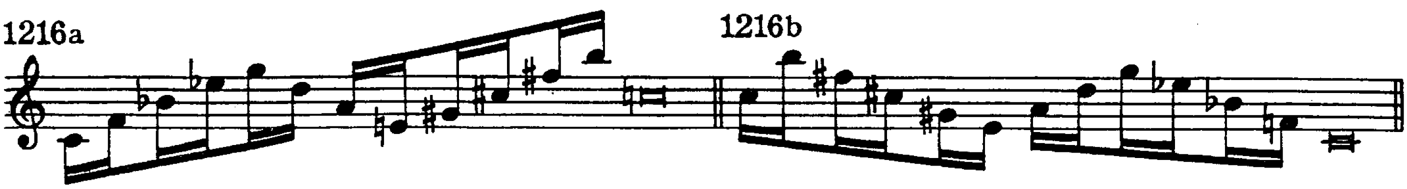
**1214a** Thirds — **1214b** [Retrograde Pattern]



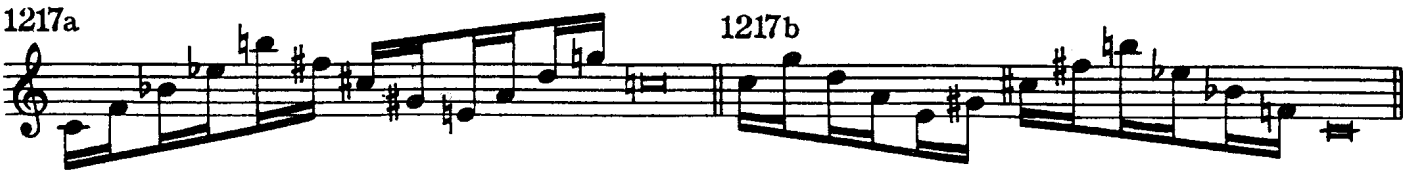
**1215a** Fourths — **1215b**
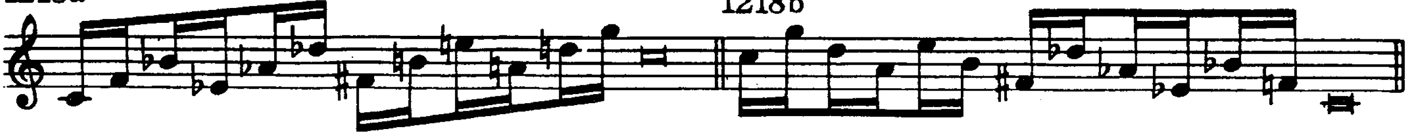


**1216a** — **1216b**



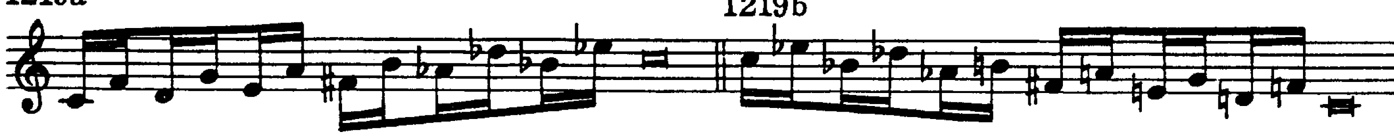
**1217a** — **1217b**
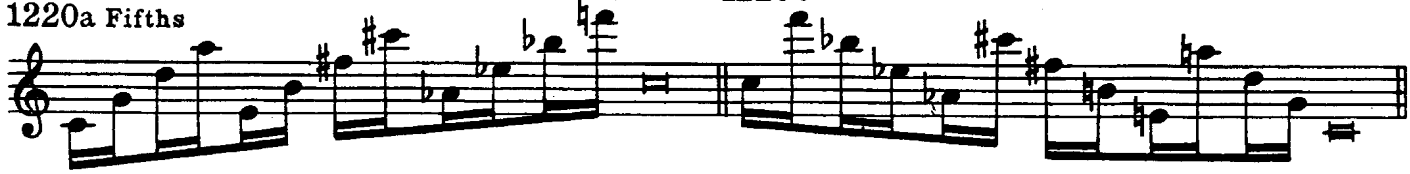


**1218a** — **1218b**
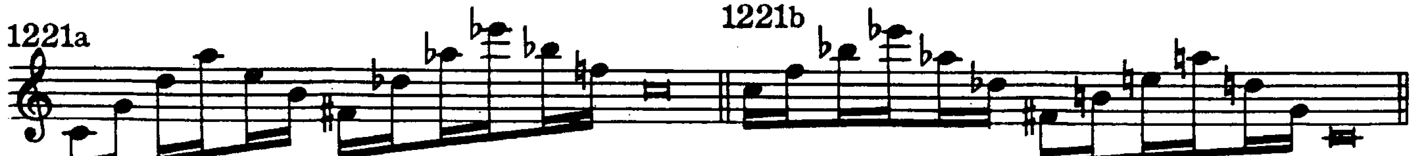


**1219a** — **1219b**



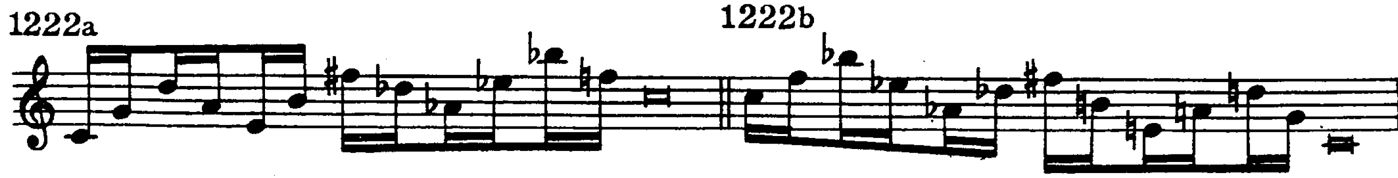
**1220a** Fifths — **1220b**

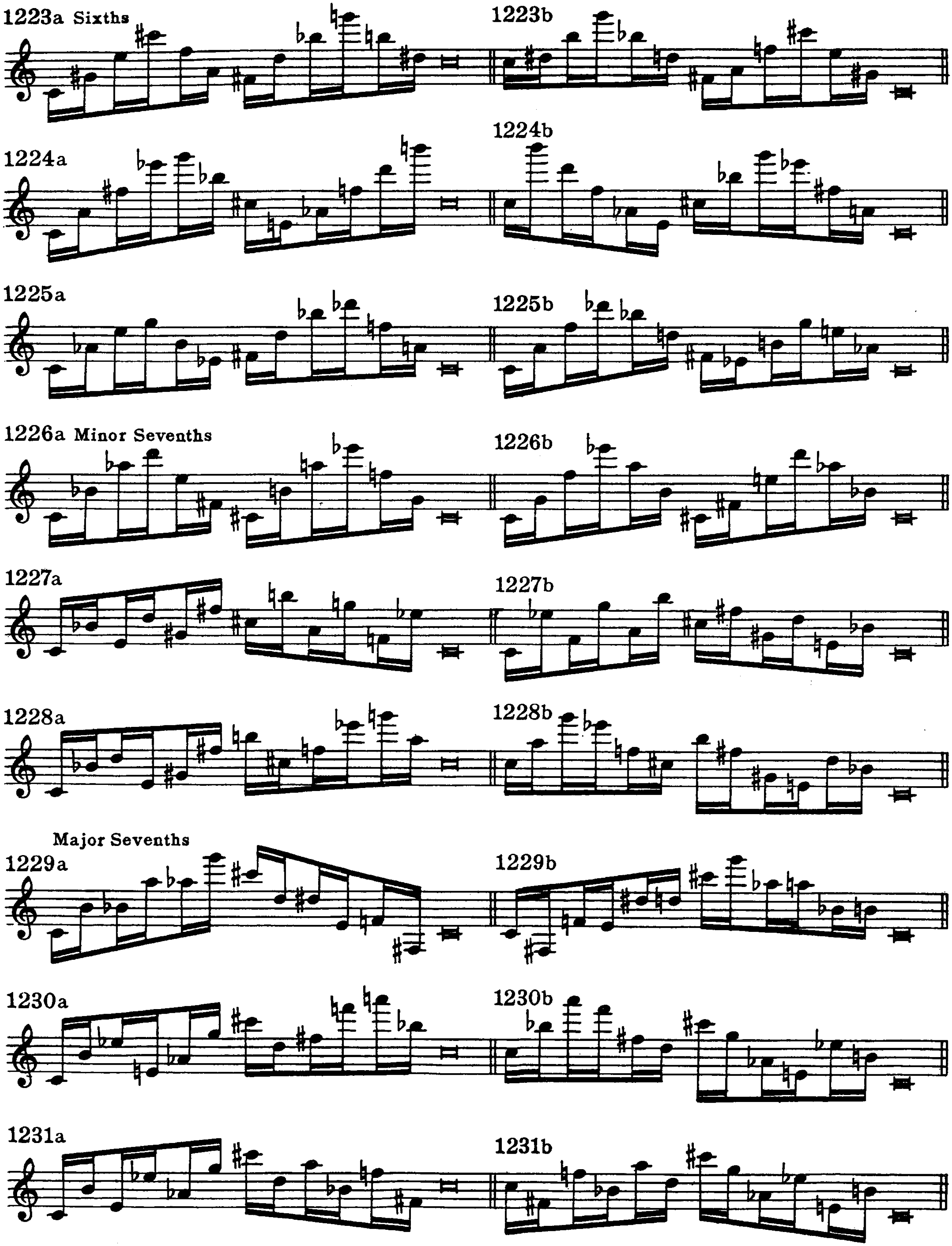


**1221a** — **1221b**
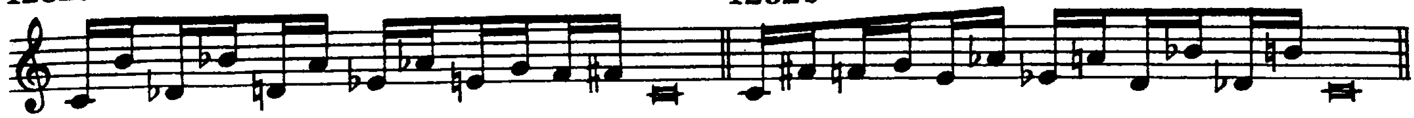


**1222a** — **1222b**



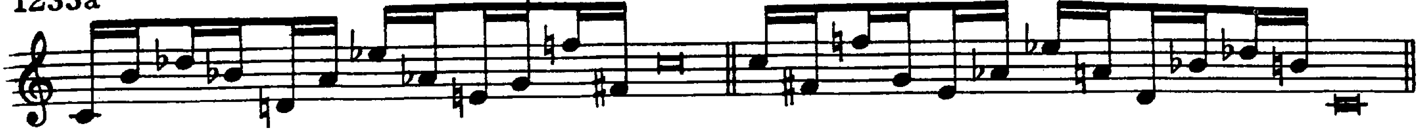

1223a Sixths
1223b
1224a
1224b
1225a
1225b
1226a Minor Sevenths
1226b
1227a
1227b
1228a
1228b
Major Sevenths
1229a
1229b
1230a
1230b
1231a
1231b

# Twelve-Tone Spirals
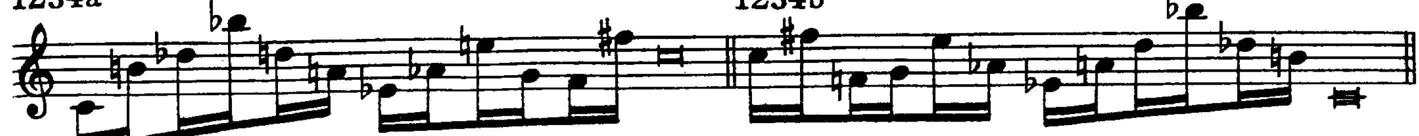
1232a 1232b
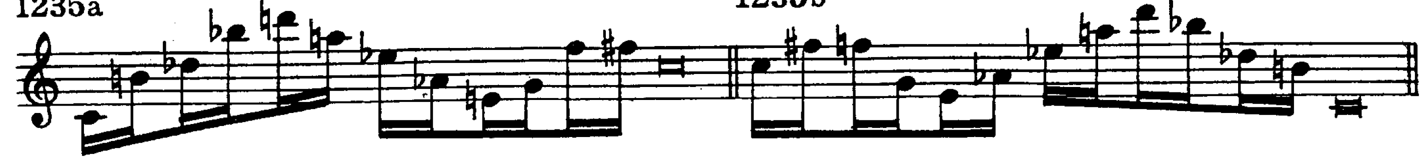


1233a 1233b
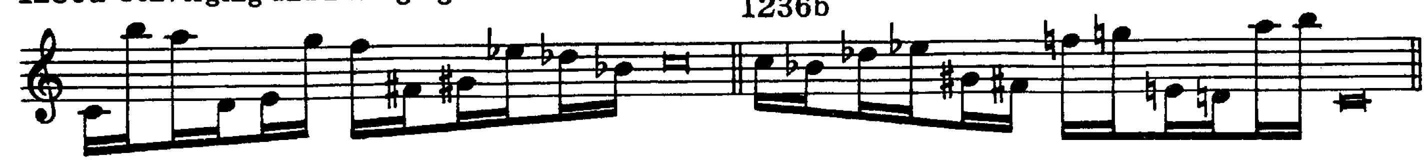


1234a 1234b
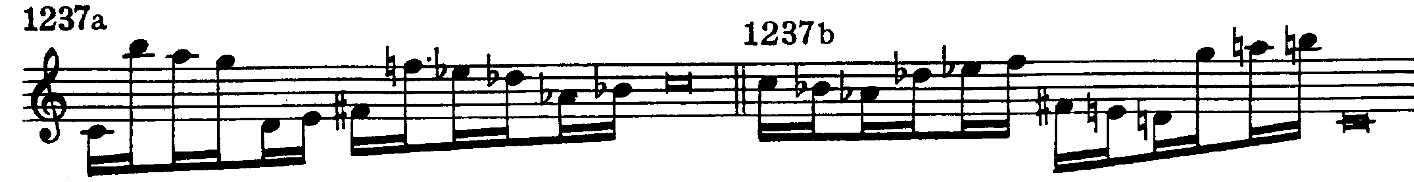


1235a 1235b
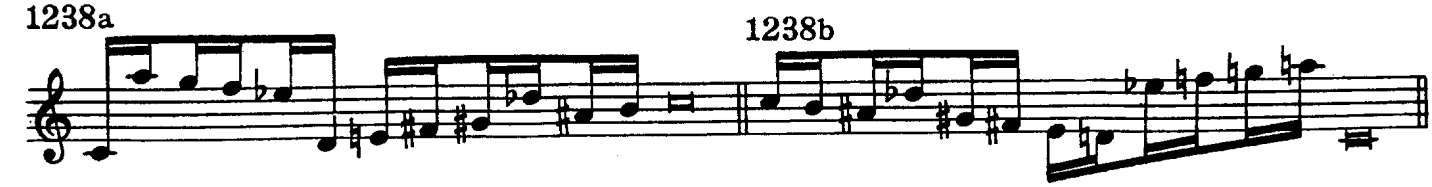


1236a Converging and Diverging Whole-Tone Scales 1236b



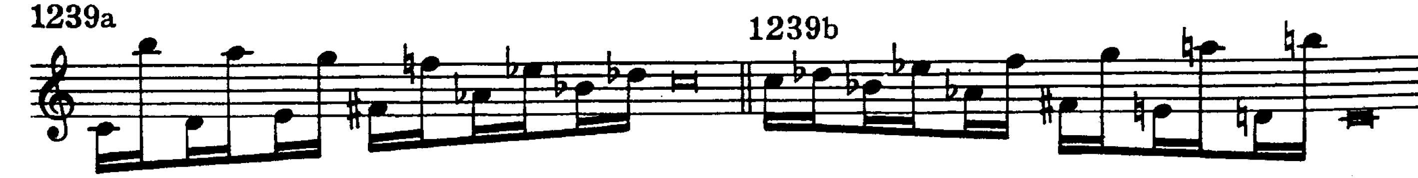
1237a 1237b
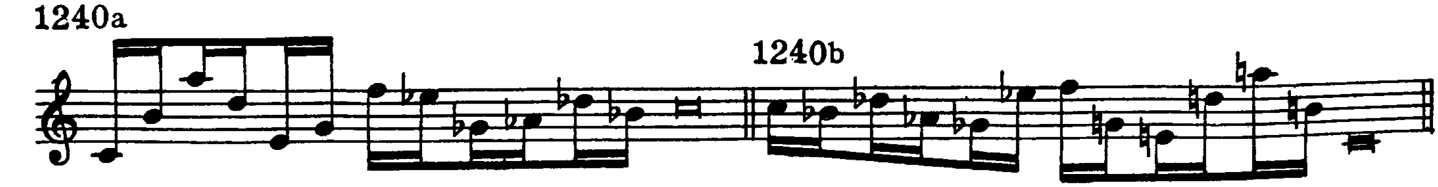


1238a 1238b



1239a 1239b
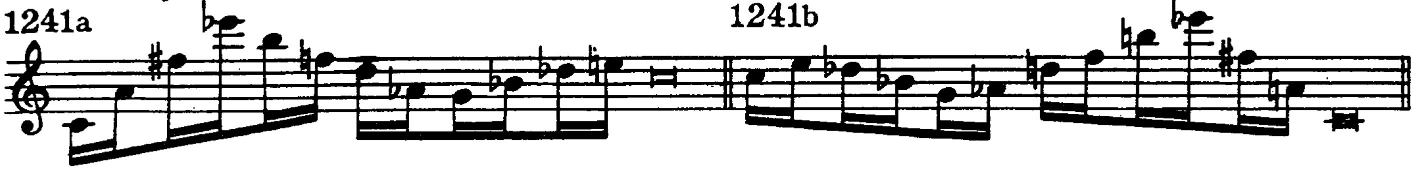


1240a 1240b
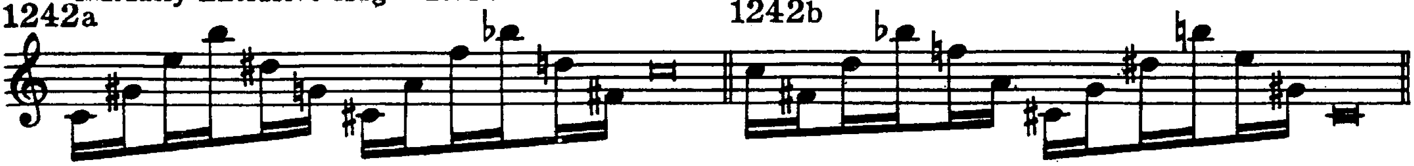


Mutually Exclusive Diminished-Seventh Chords

1241a 1241b



Mutually Exclusive Augmented Triads

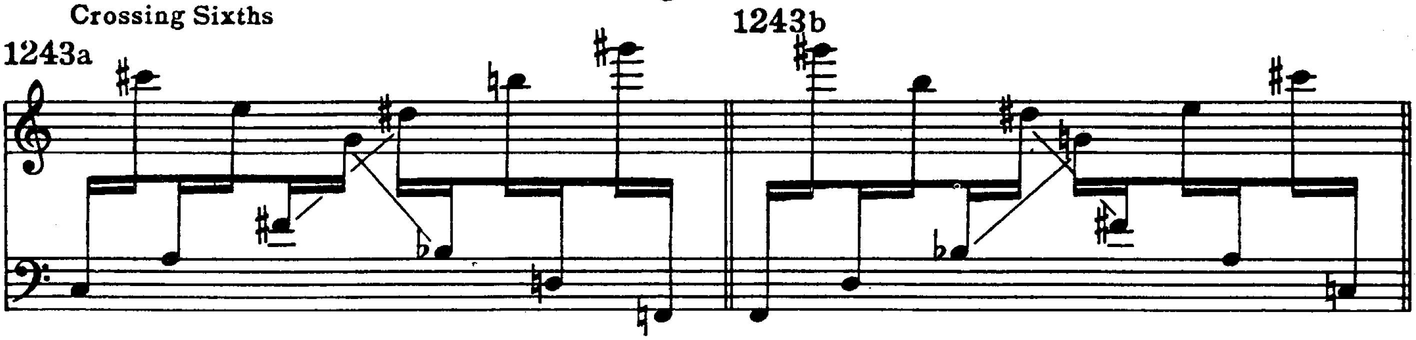
1242a 1242b
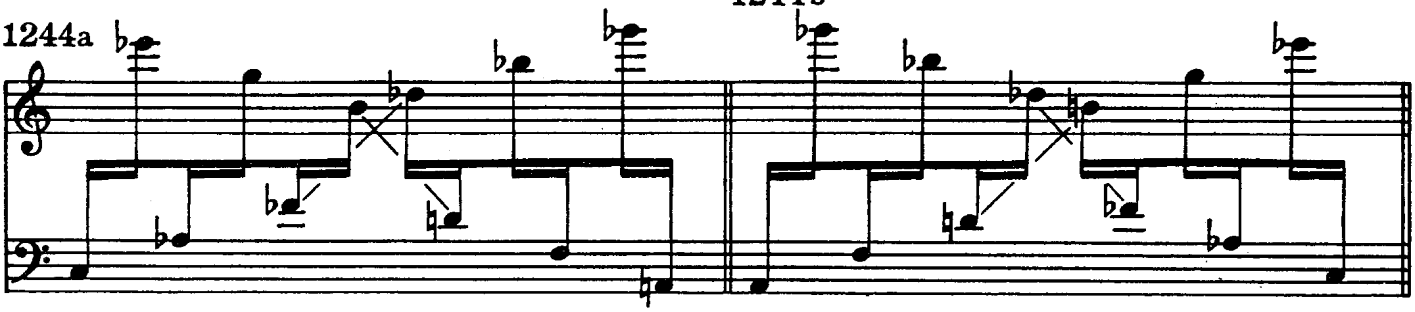


## Crossing Intervals

Crossing Sixths

1243a 1243b
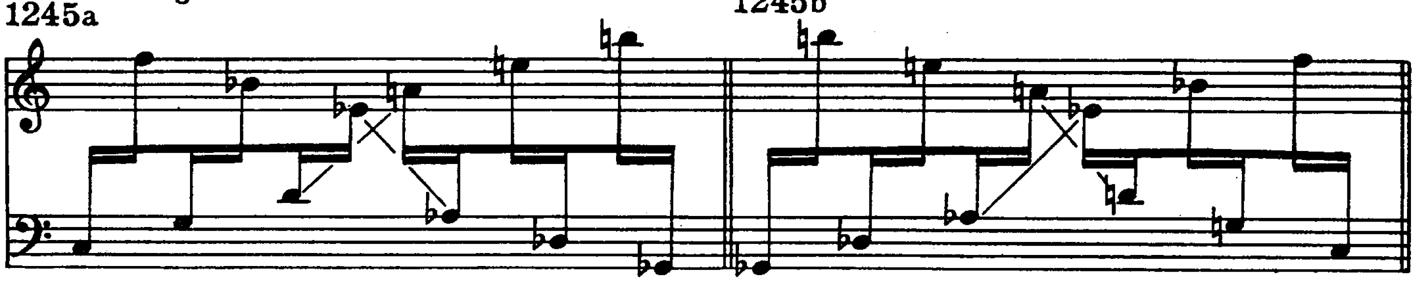


1244a 1244b
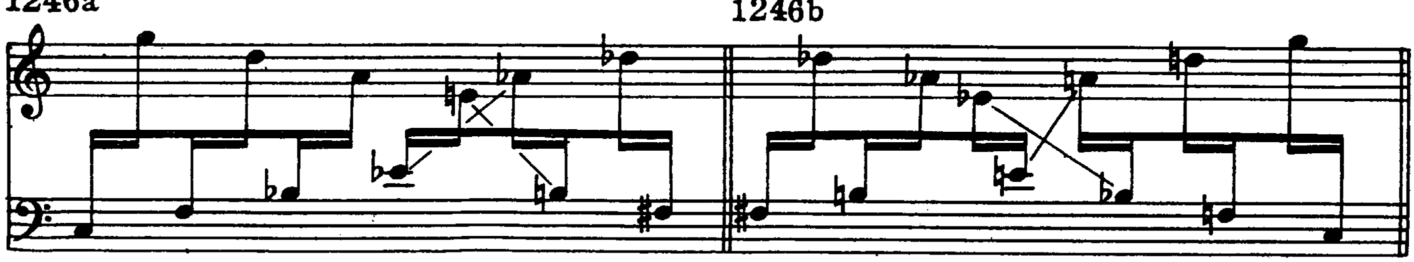


Crossing Fifths

1245a 1245b
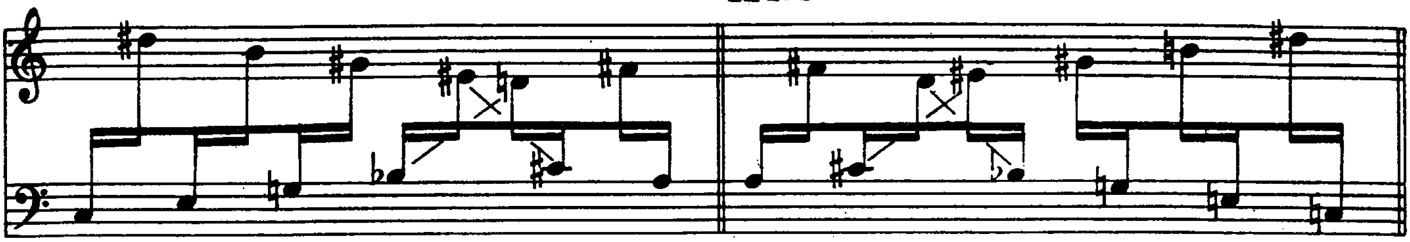


Crossing Fourths

1246a 1246b
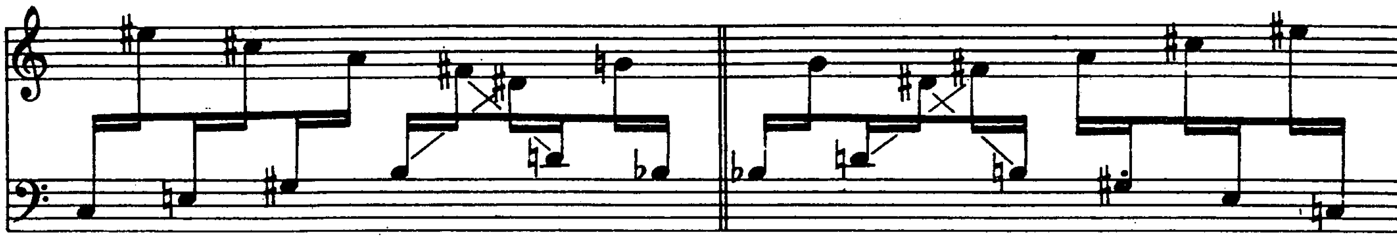


1247a Crossing Thirds

1247b
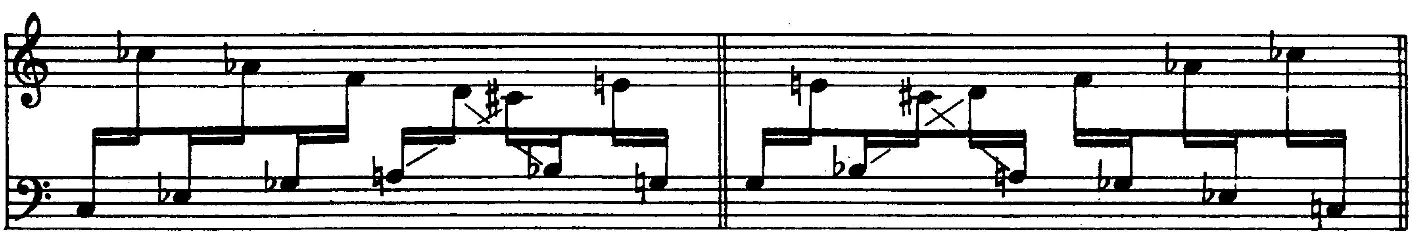


1248a

1248b
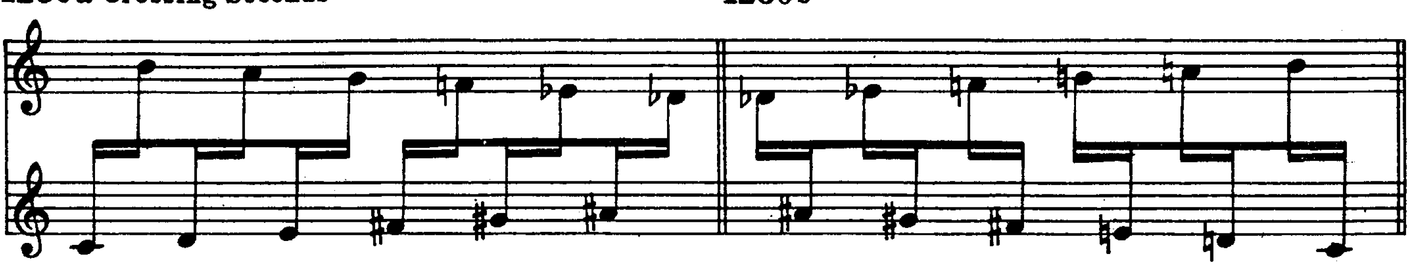


1249a

1249b



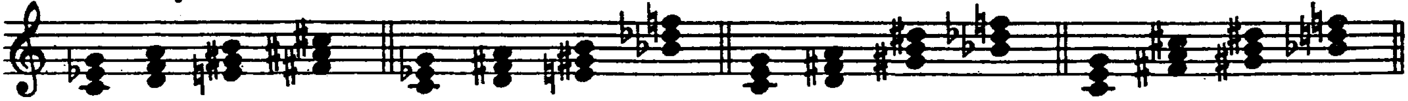
1250a Crossing Seconds

1250b

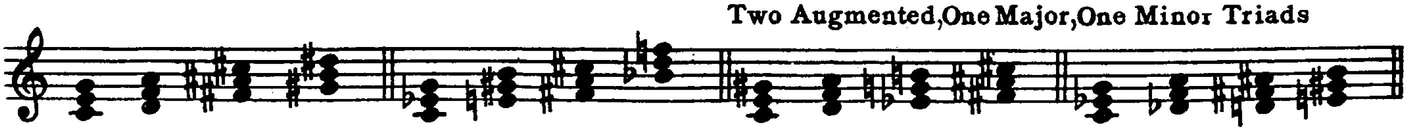


## Division of Twelve Tones into Four Mutually Exclusive Triads

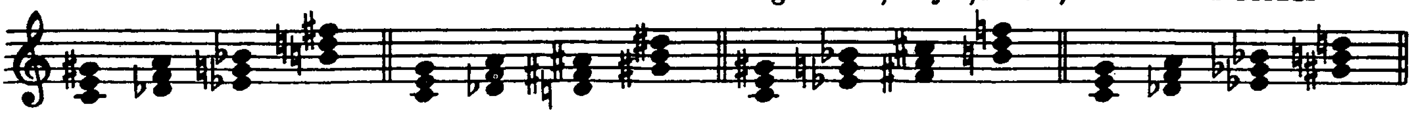
Two Major and Two Minor Triads
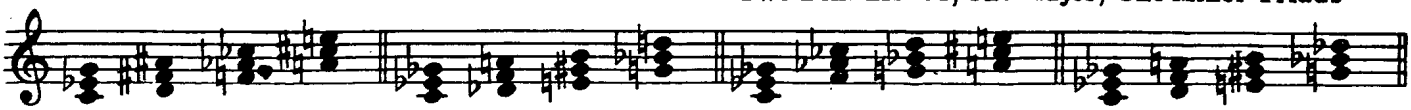


Two Augmented, One Major, One Minor Triads
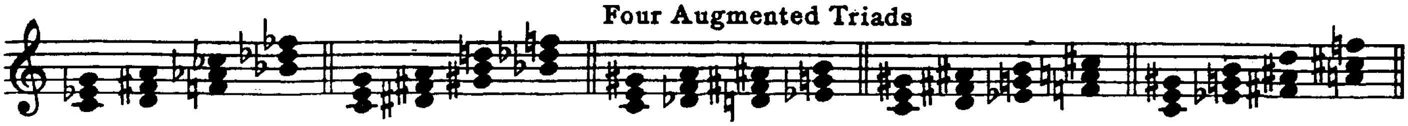


Augmented, Major, Minor, Diminished Triads



Two Diminished, One Major, One Minor Triads
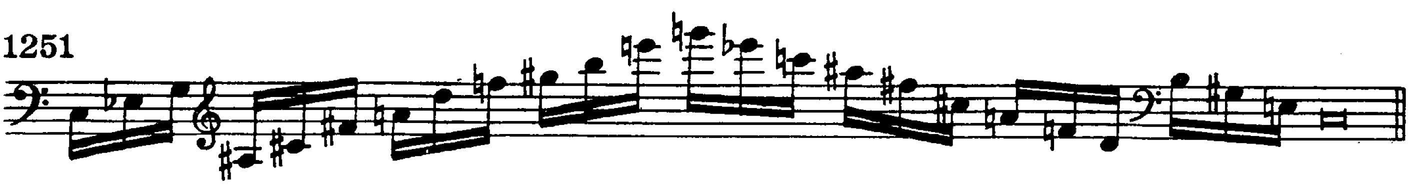


Four Augmented Triads



## Quadritonal Arpeggios

1251
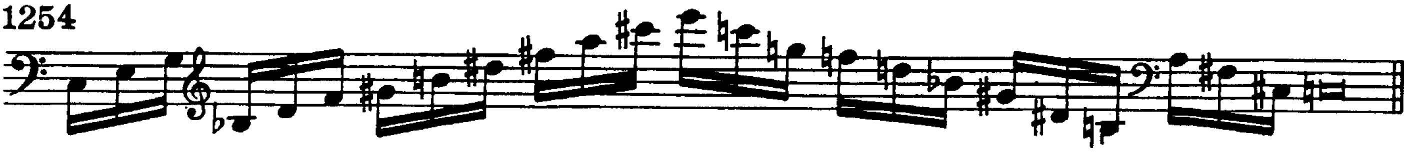


1252
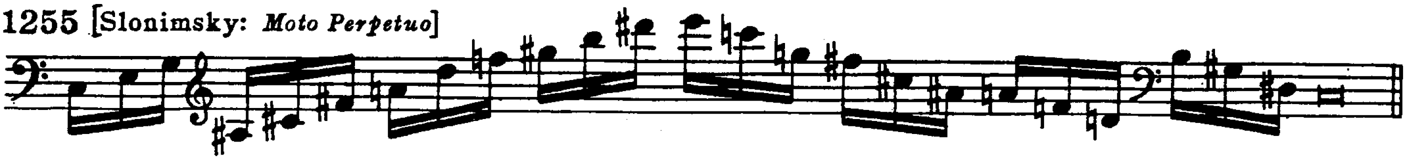


1253



1254

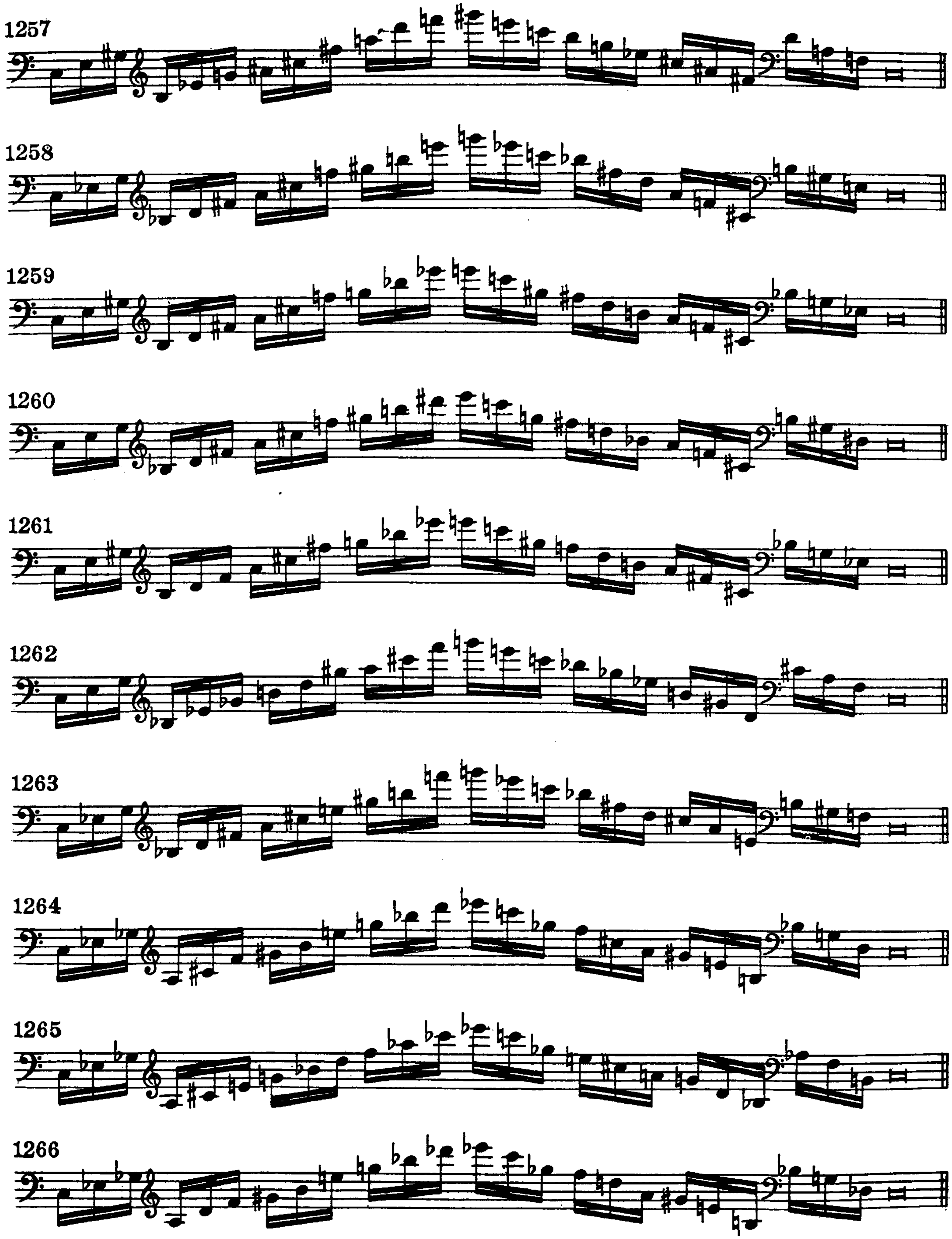


1255 [Slonimsky: *Moto Perpetuo*]
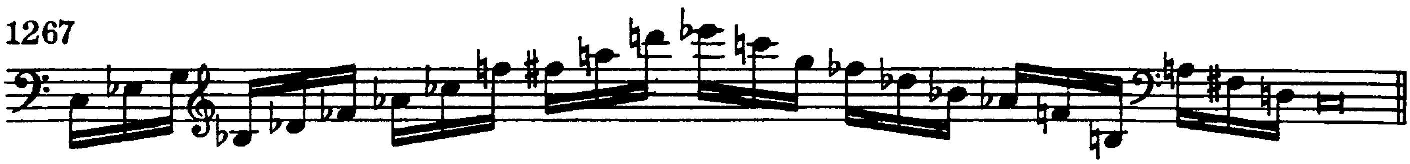


1256

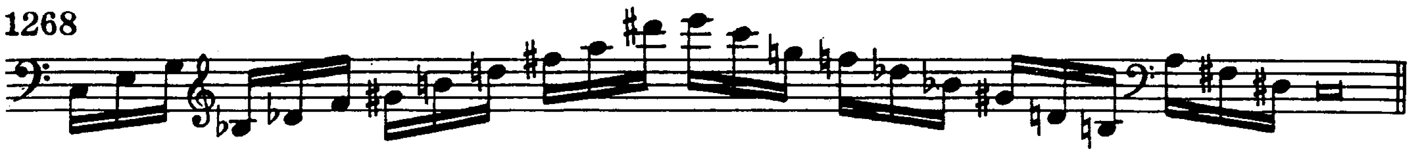



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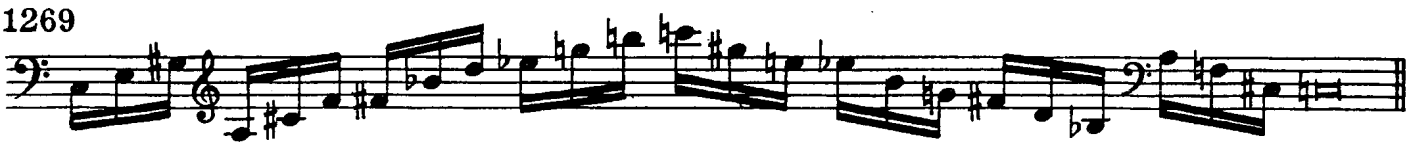
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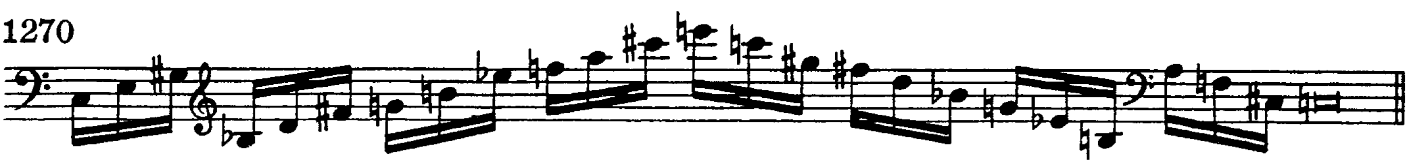


1268
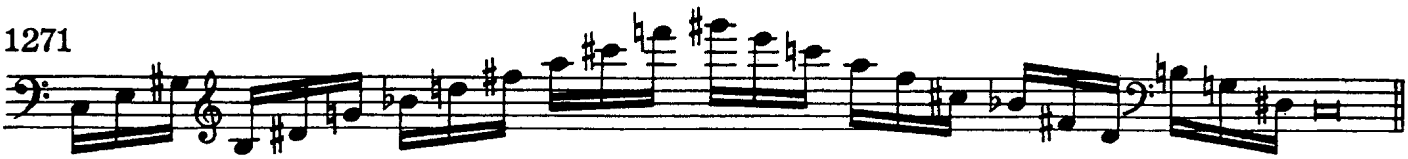


1269



1270



1271



Inversions
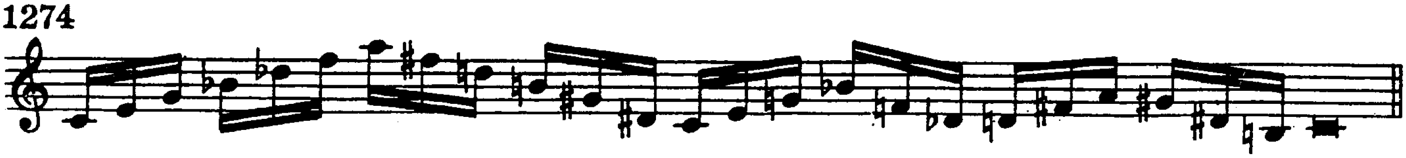
1272



1273
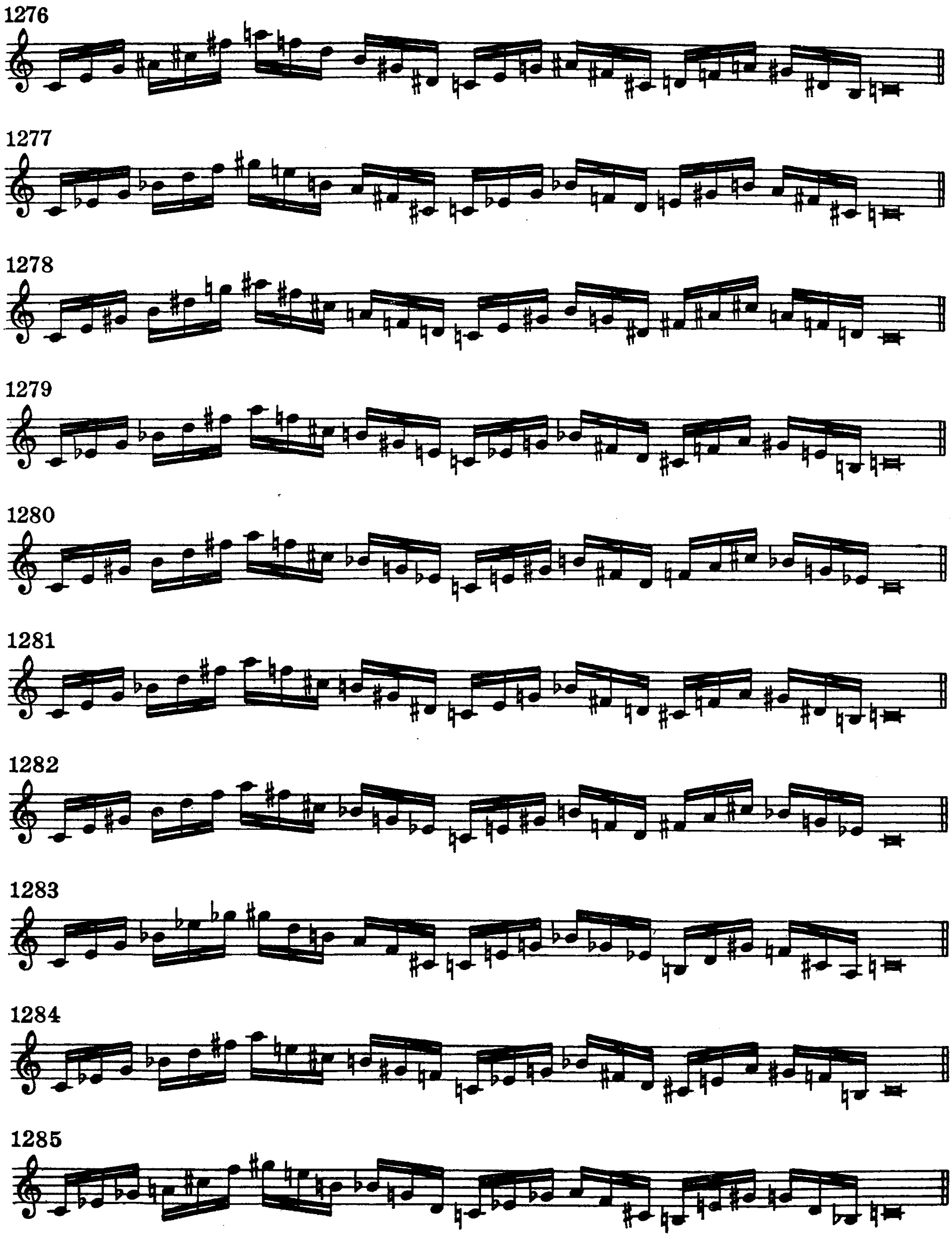


1274



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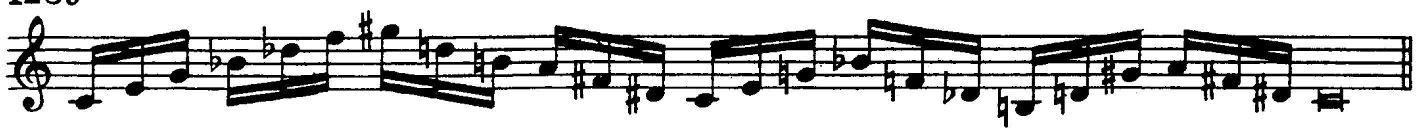


1287
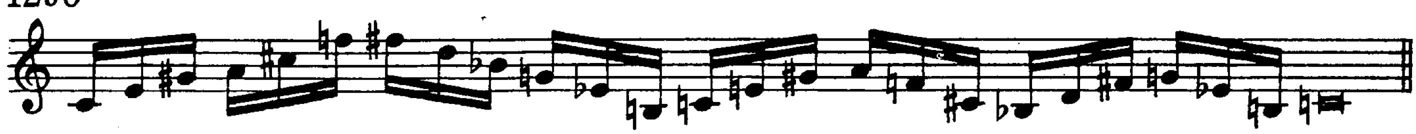


1288
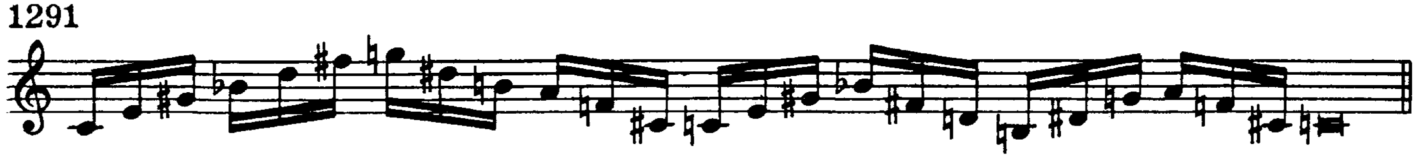


1289
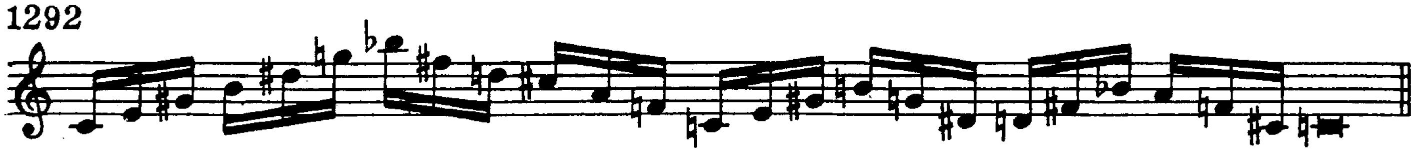


1290



1291
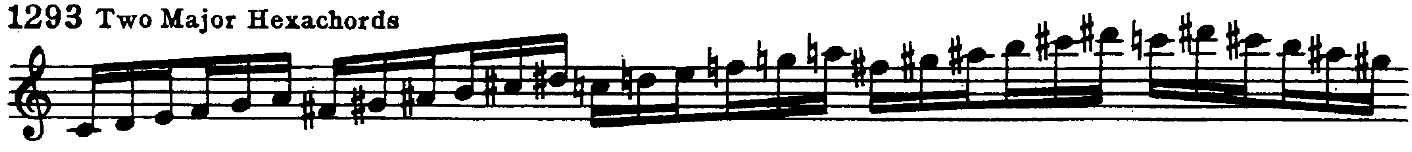


1292



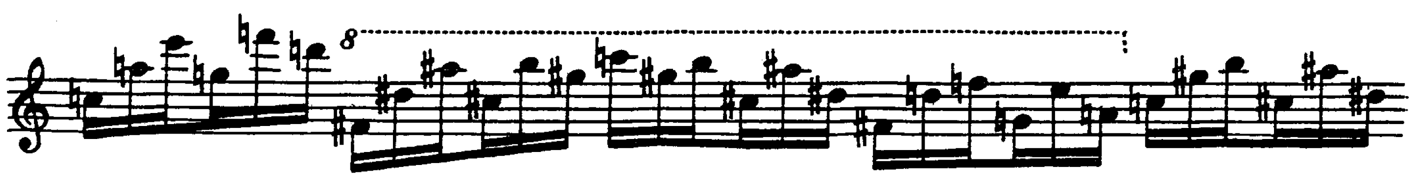
## Miscellaneous Dodecaphonic Patterns
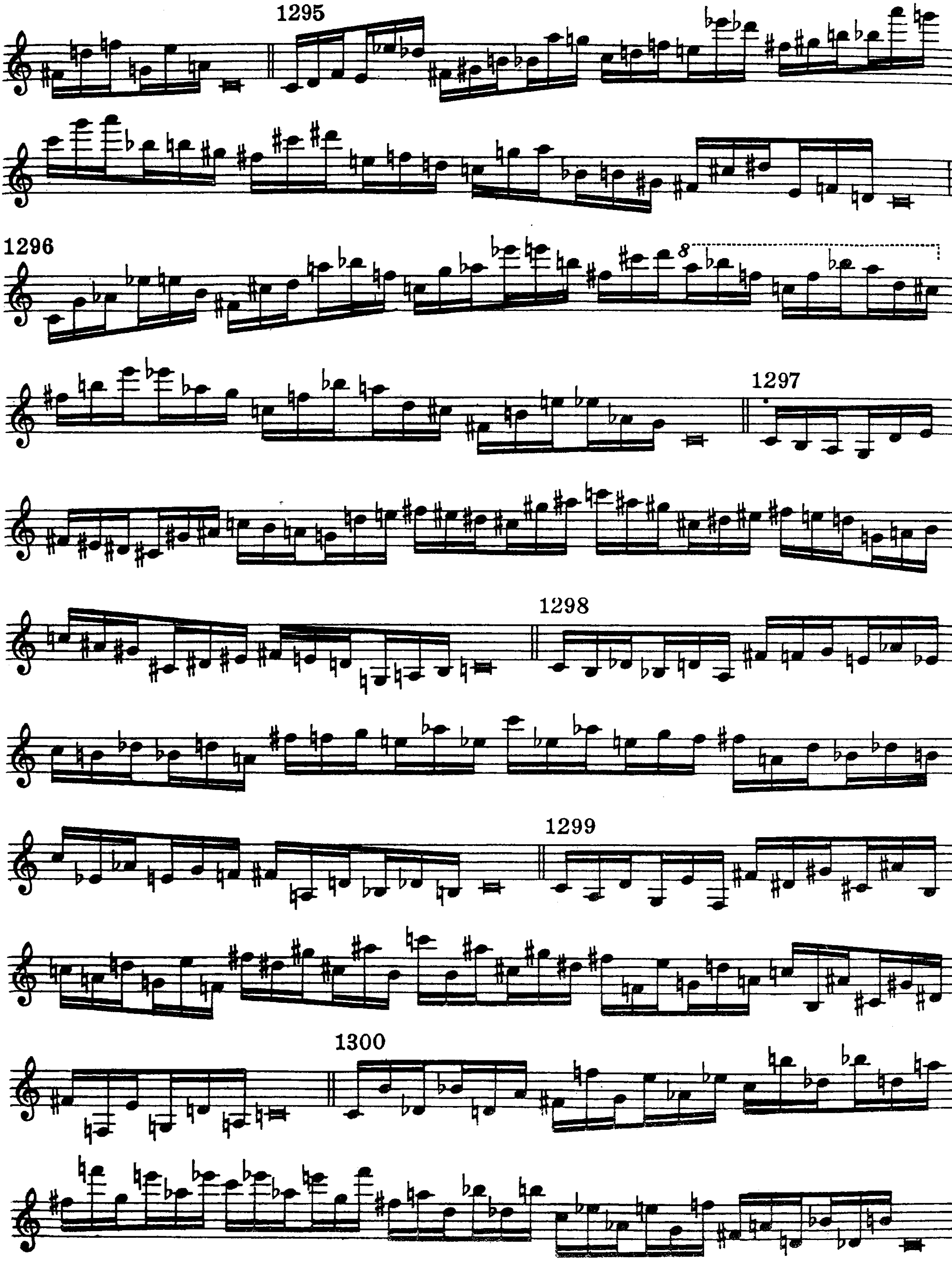
**1293** Two Major Hexachords



1294



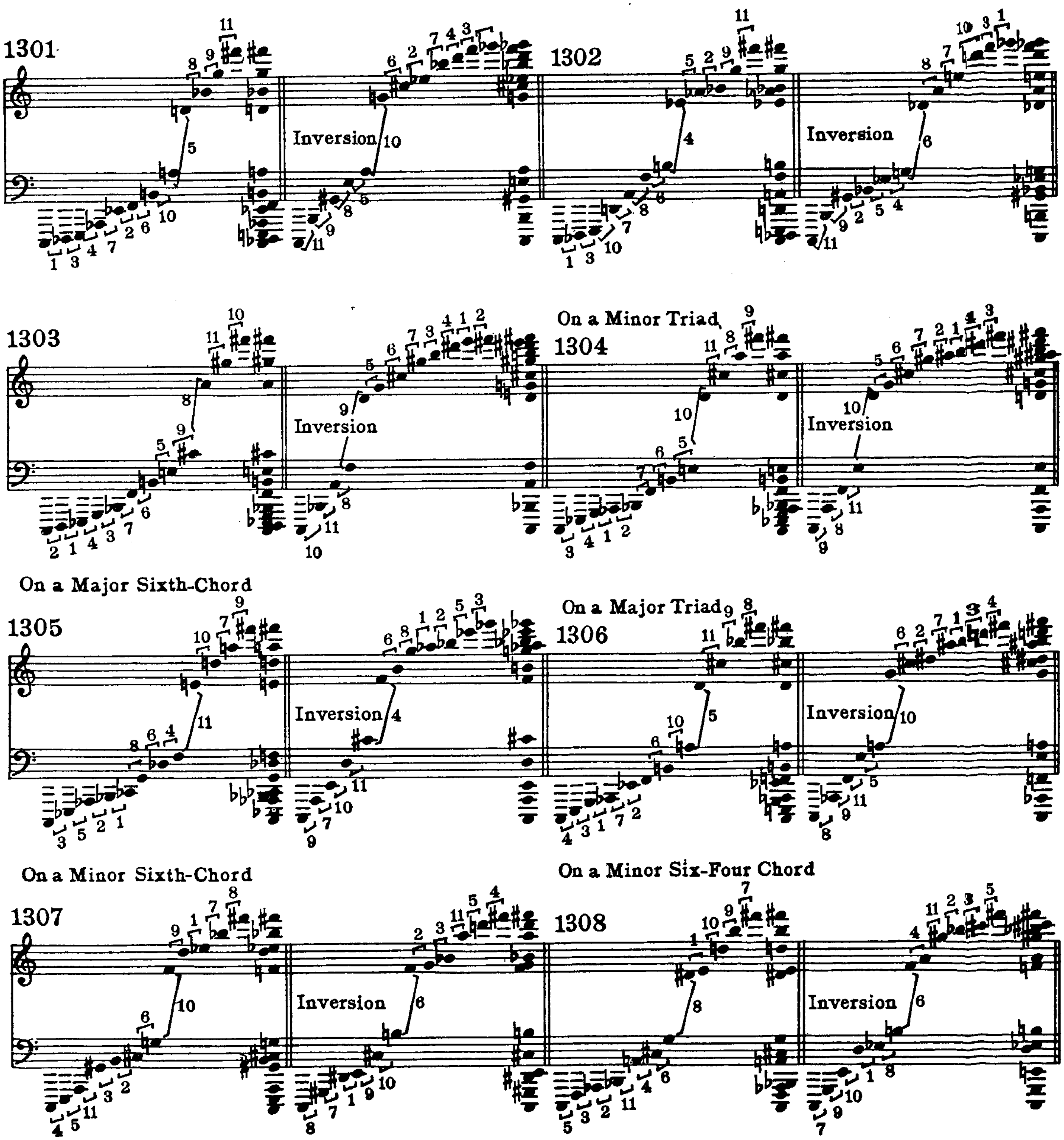



1295
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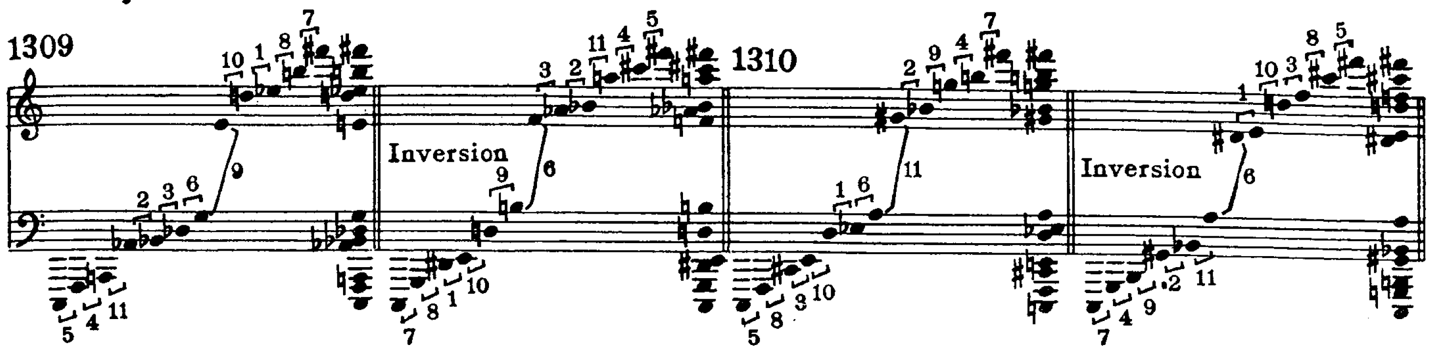
# Invertible Dodecaphonic Progressions

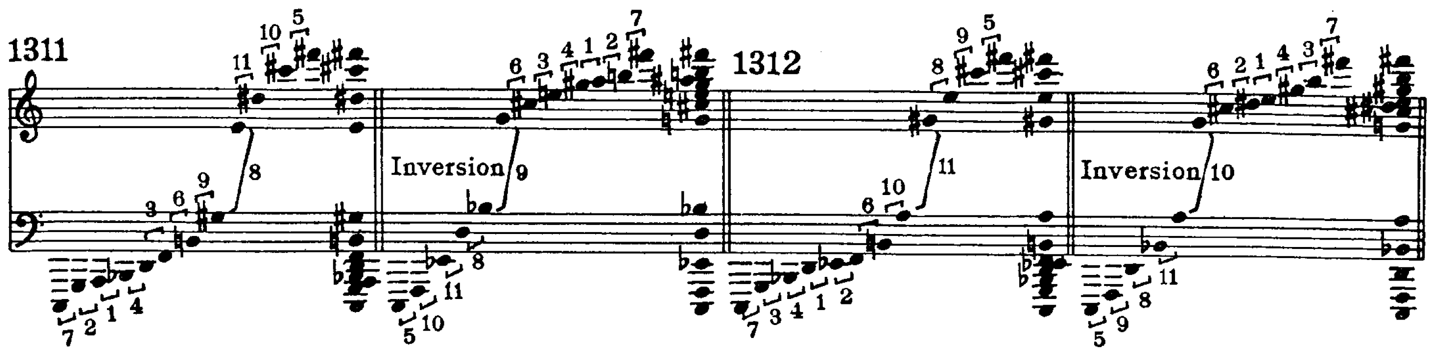
## With All Different Intervals

(Figures indicate number of semitones)

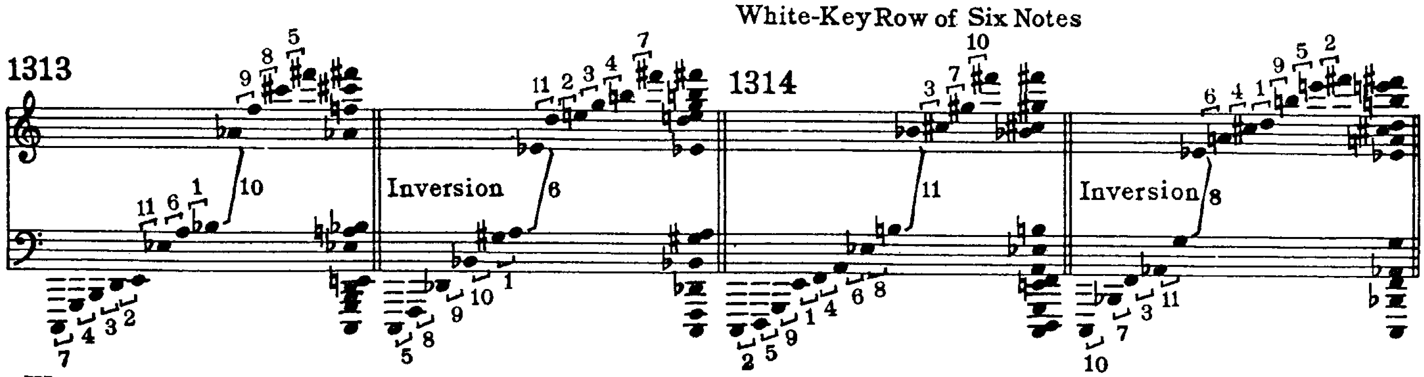


On a Major Six-Four Chord



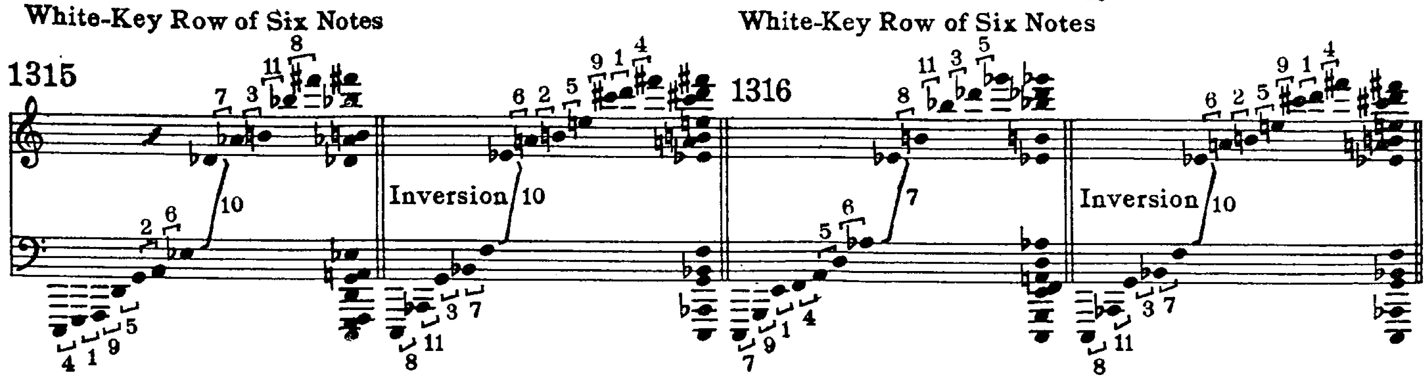




White-Key Row of Six Notes



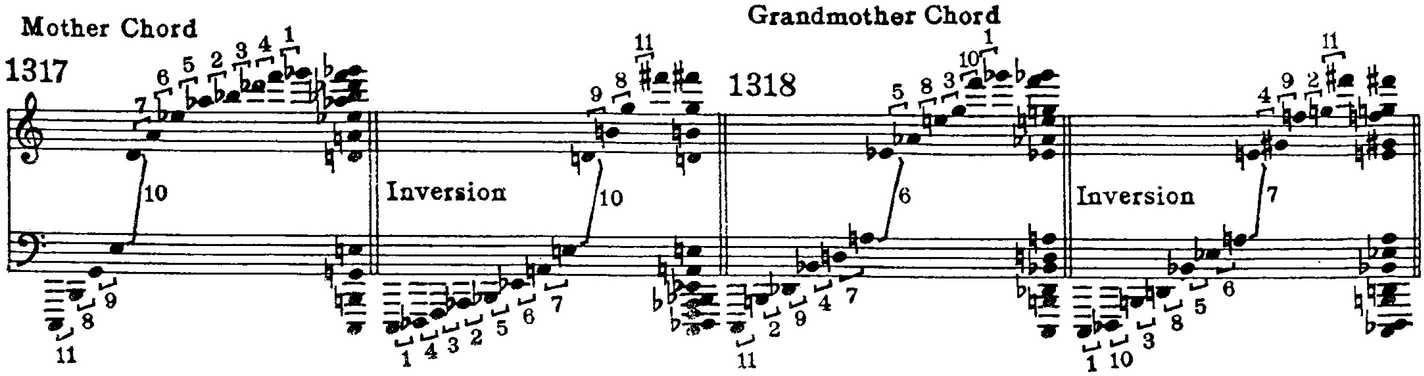

White-Key Row of Six Notes

White-Key Row of Six Notes
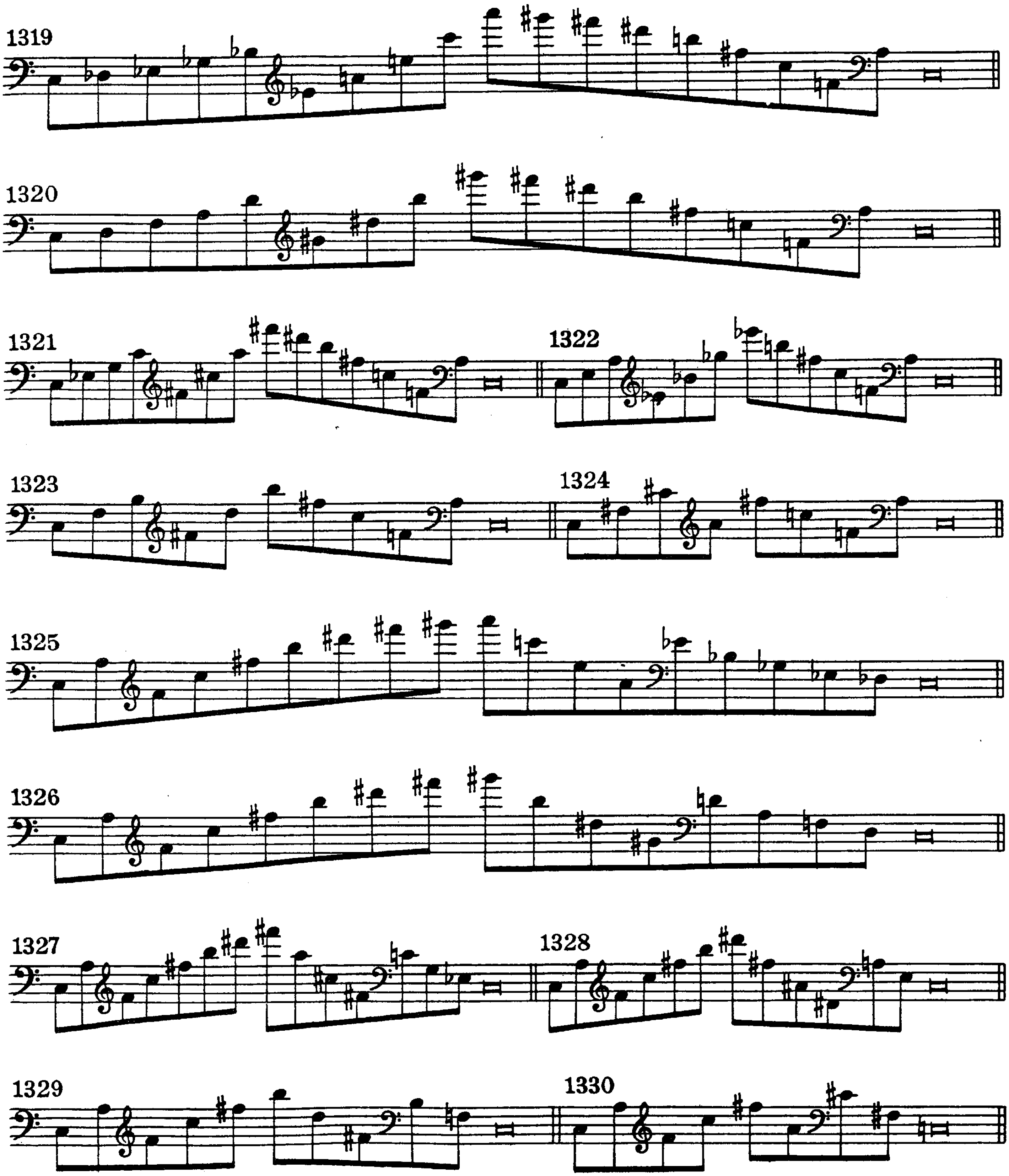



Mother Chord

Grandmother Chord
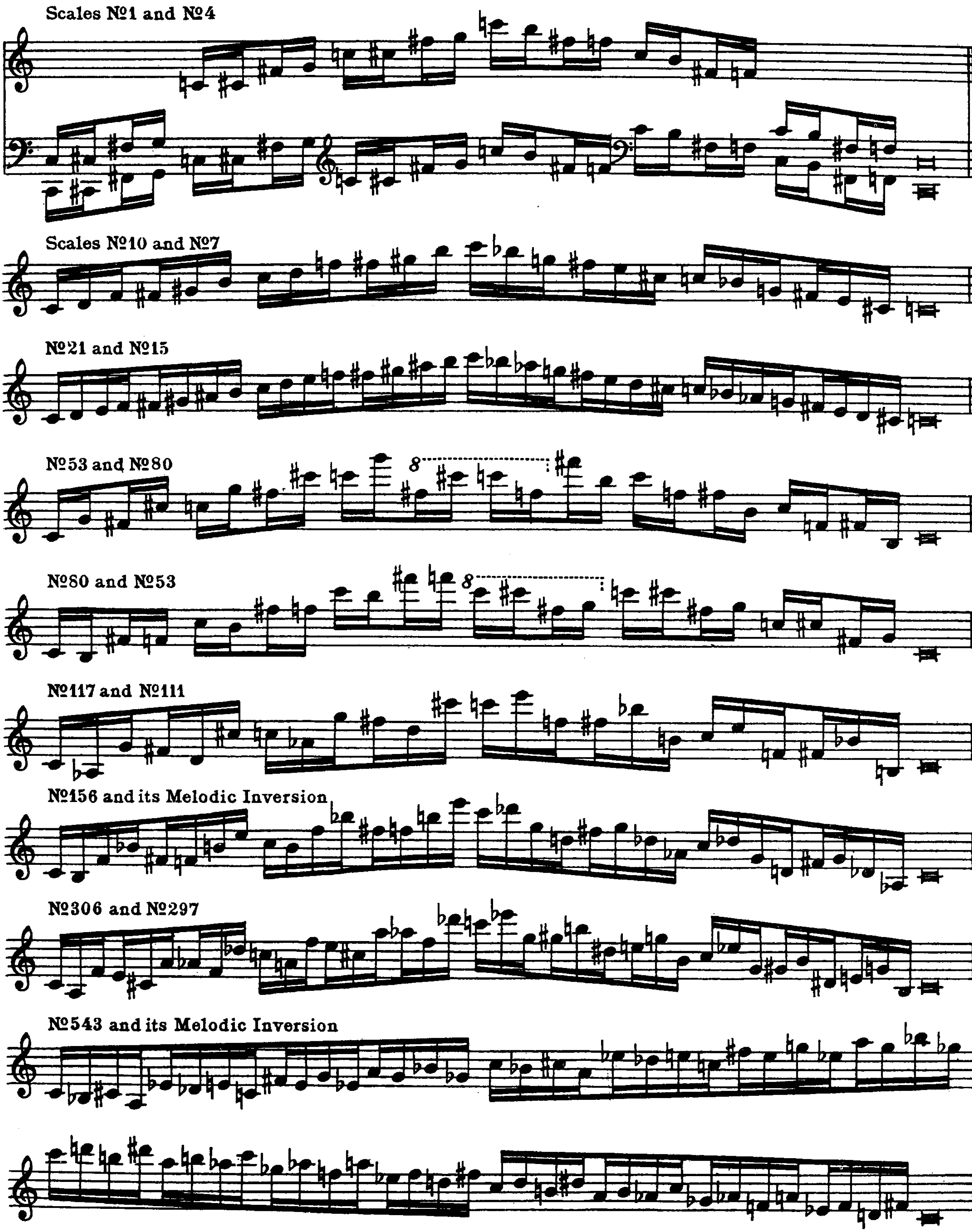


# Intervallic Series

## Increasing and Diminishing Intervals



# Mirror Interval Progressions

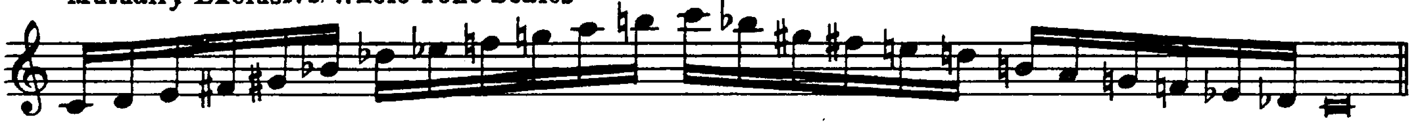


# Complementary Scales

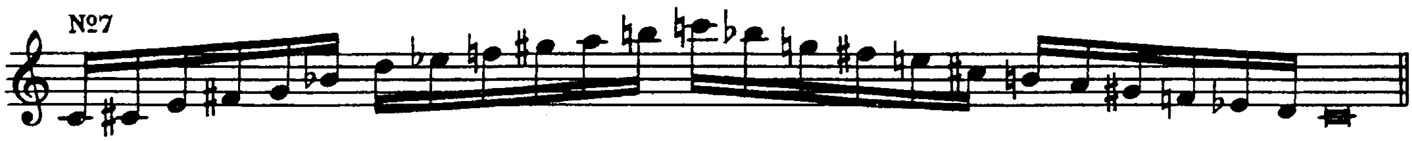
C Major and Pentatonic
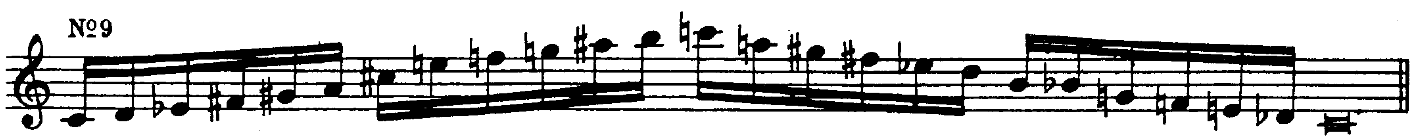


Mutually Exclusive Whole-Tone Scales
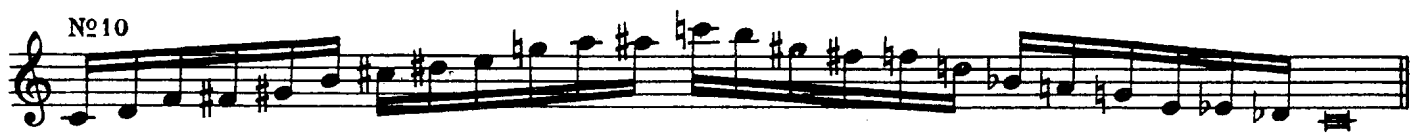


Nº7
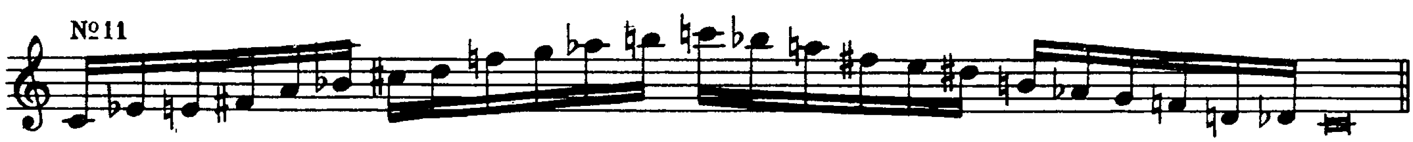


Nº9
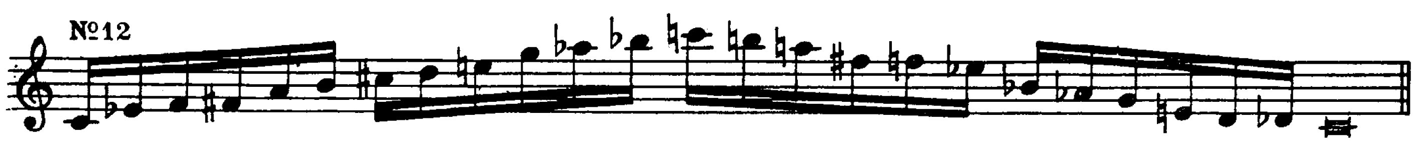


Nº10



Nº11



Nº12
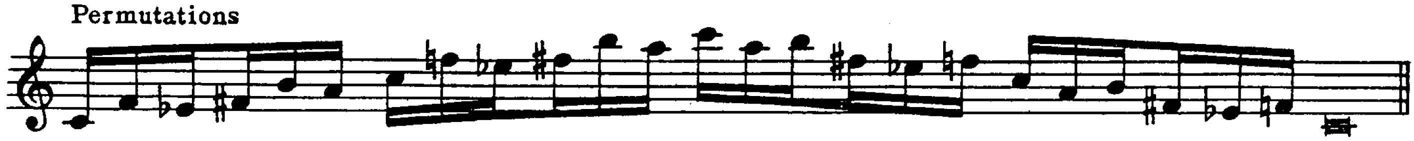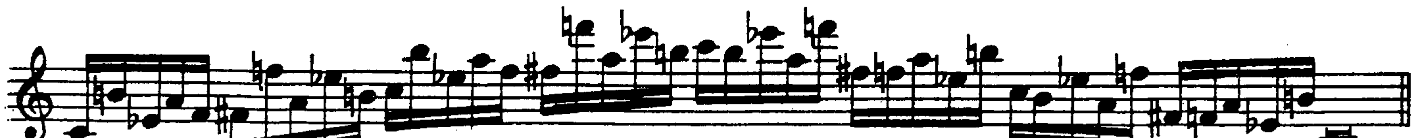


# Permutations
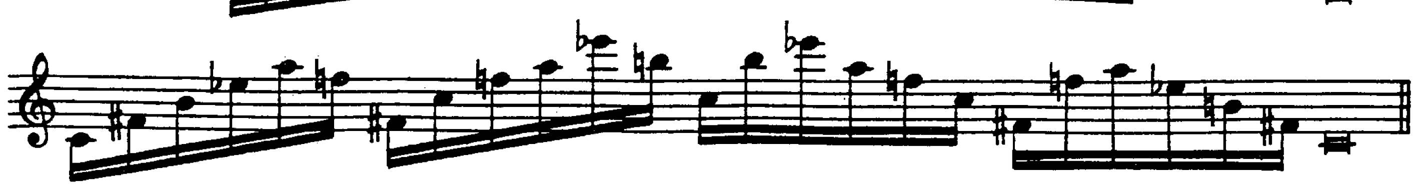
Scale Nº12
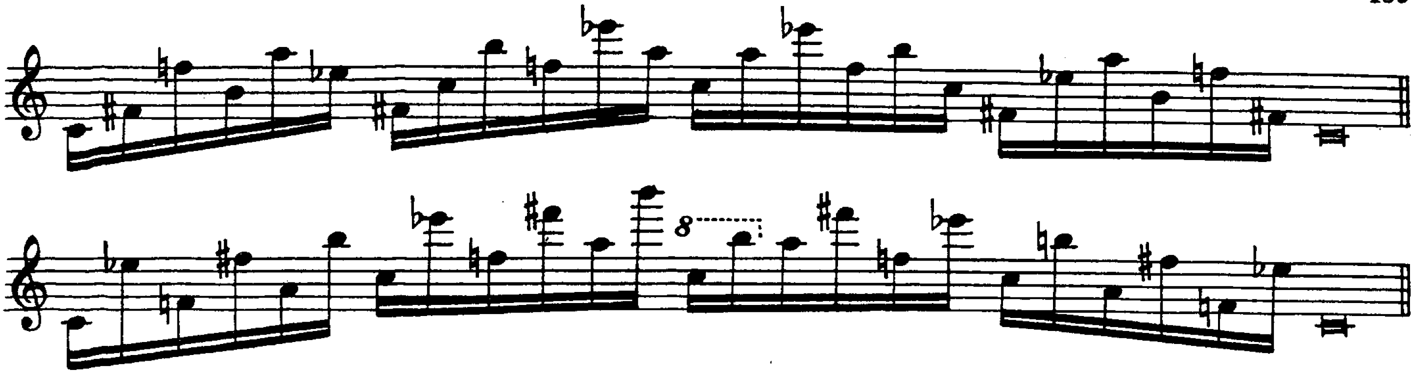


Permutations

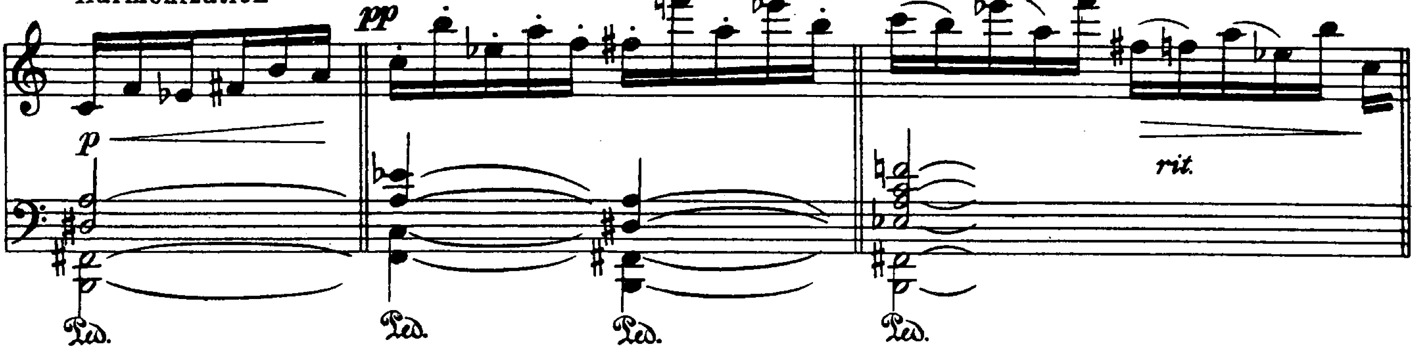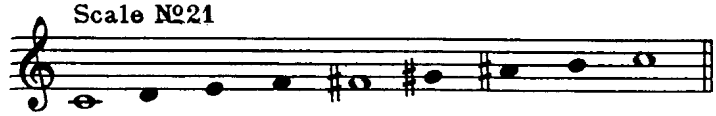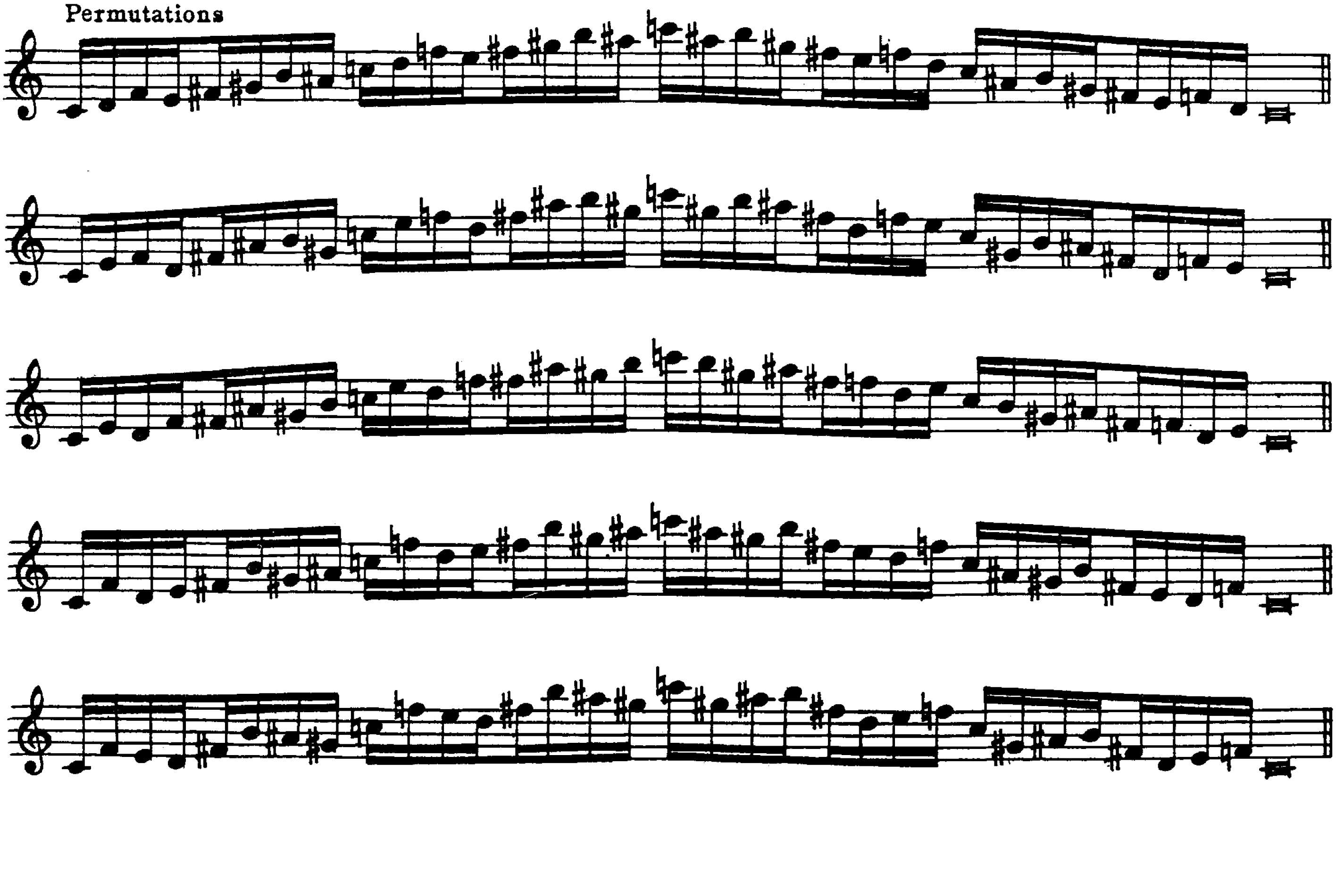









Harmonization




Scale №21
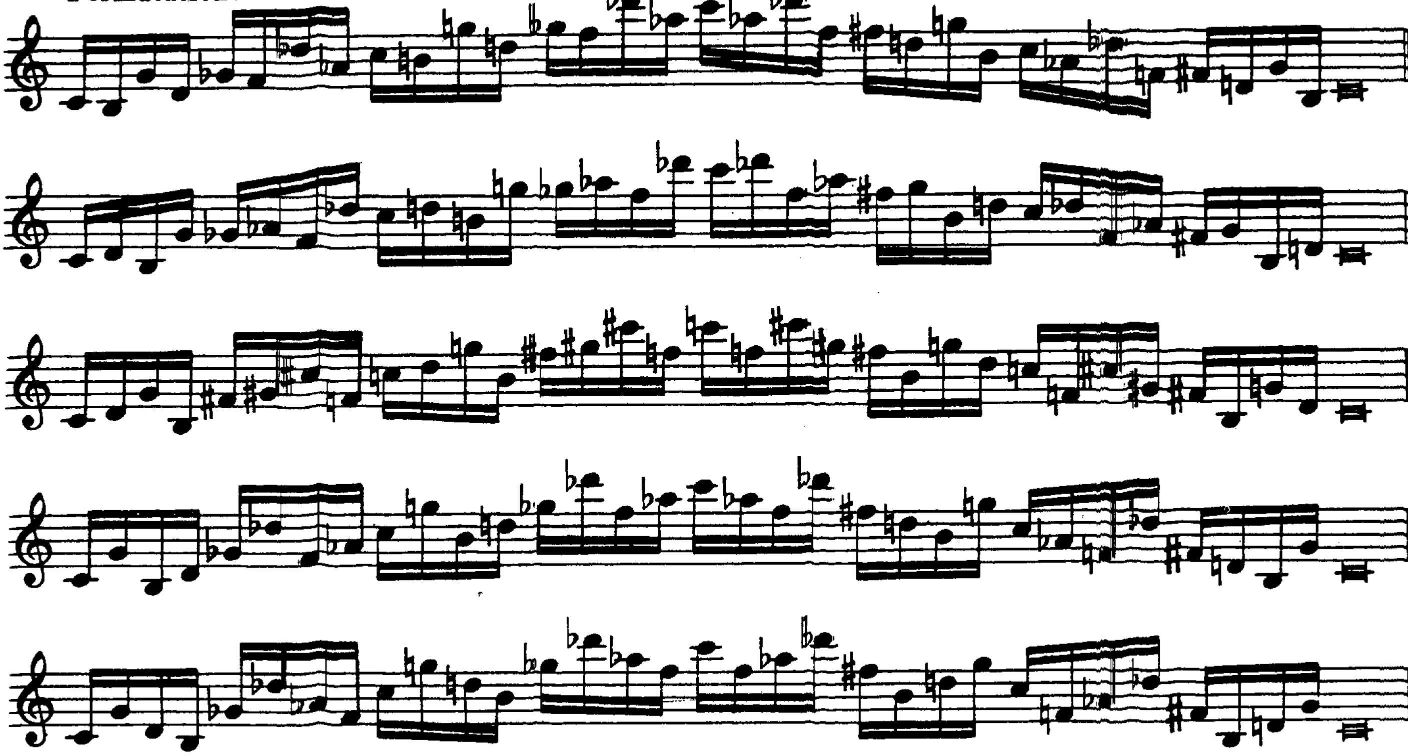


Permutations



Pattern №141



Permutations



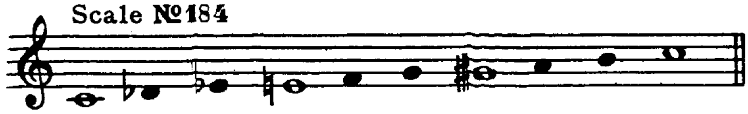
Scale №183



Permutation



Scale №184
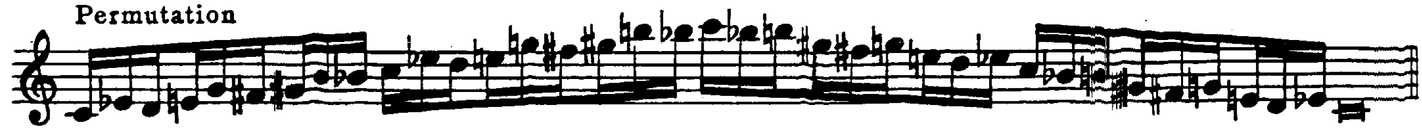


Permutation



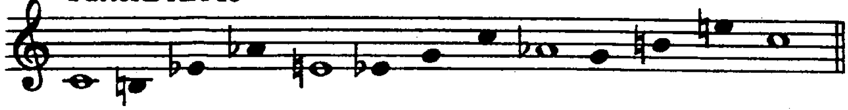
Scale №185
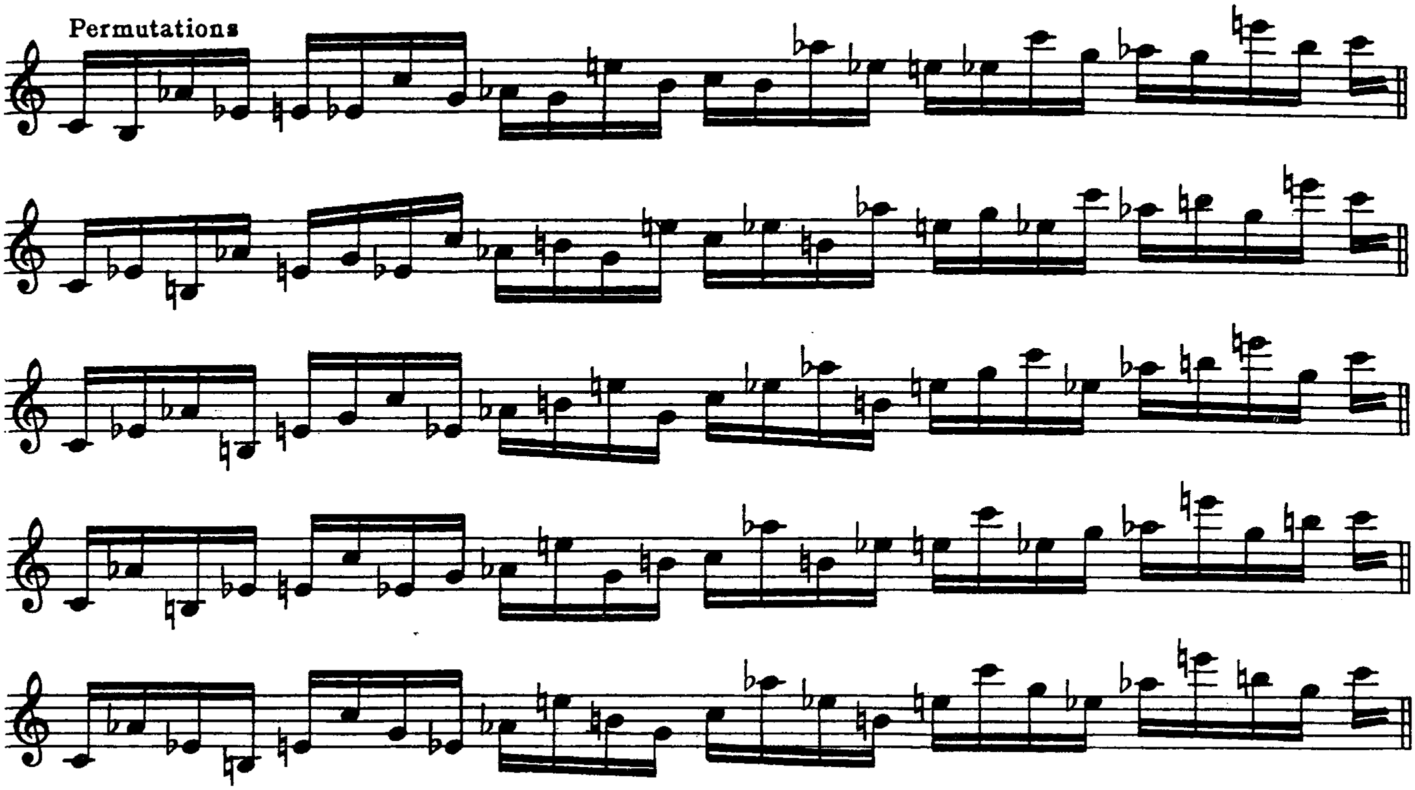


Permutation
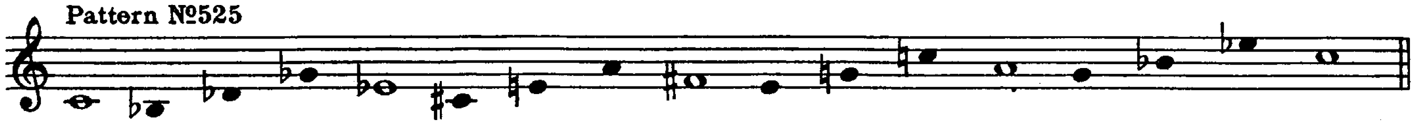


**Pattern №343**
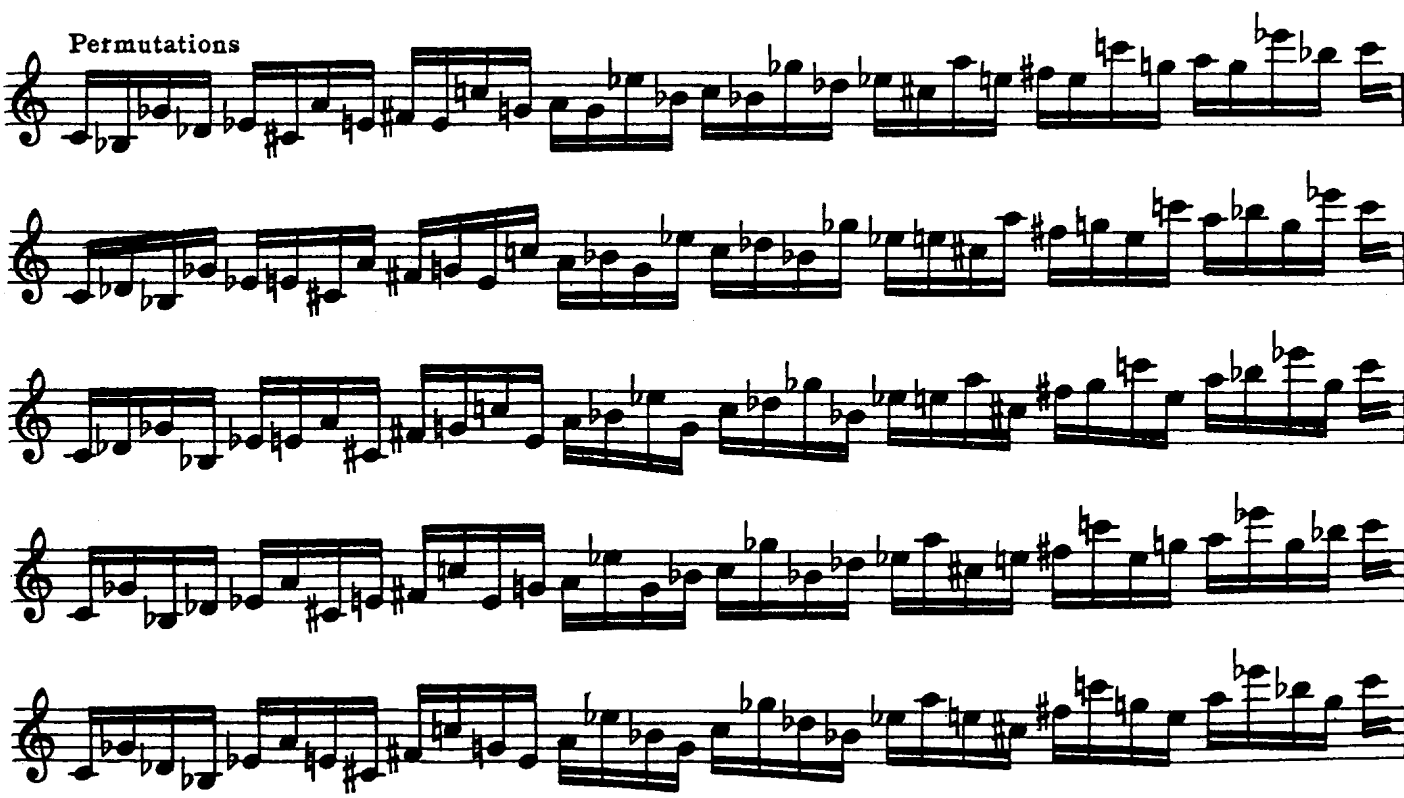


**Permutations**



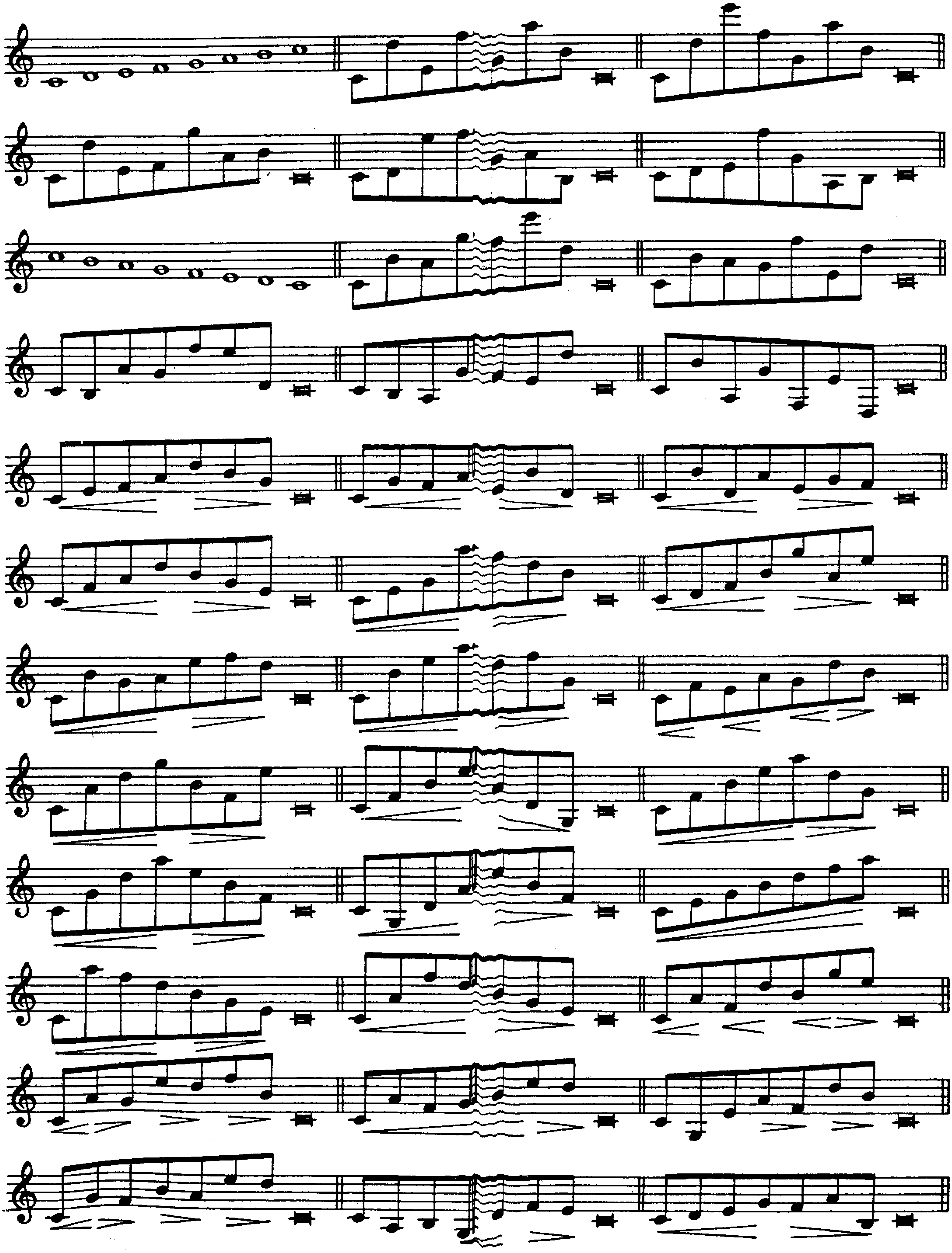
**Pattern №525**



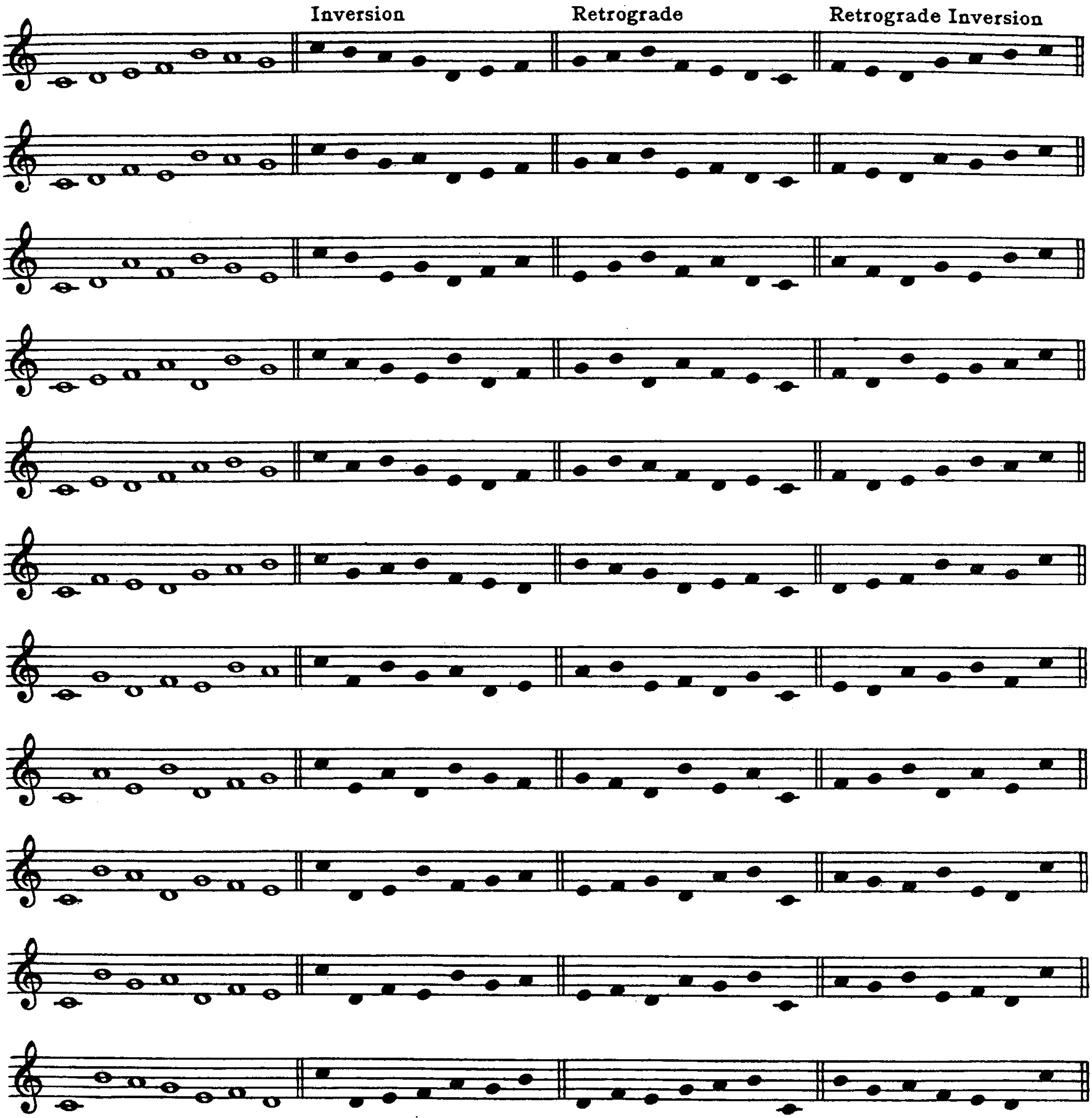
**Permutations**



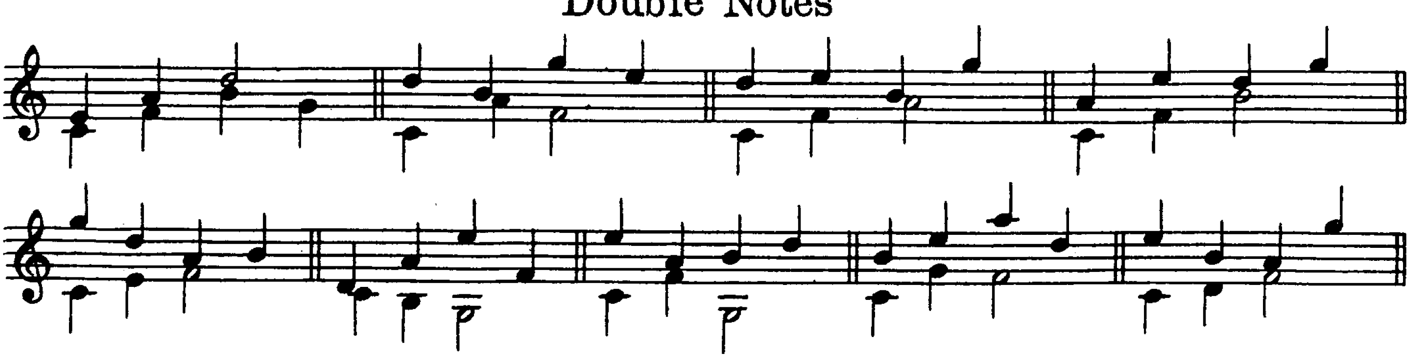
# Pandiatonic Progressions
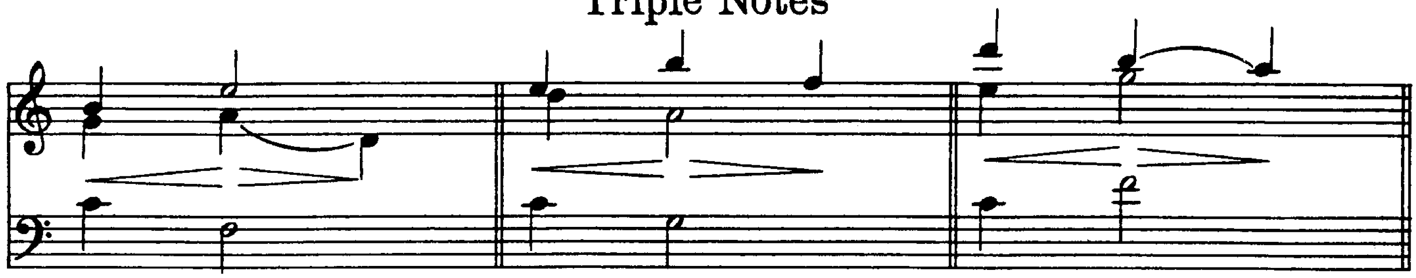


# Conjugate Pandiatonic Progressions
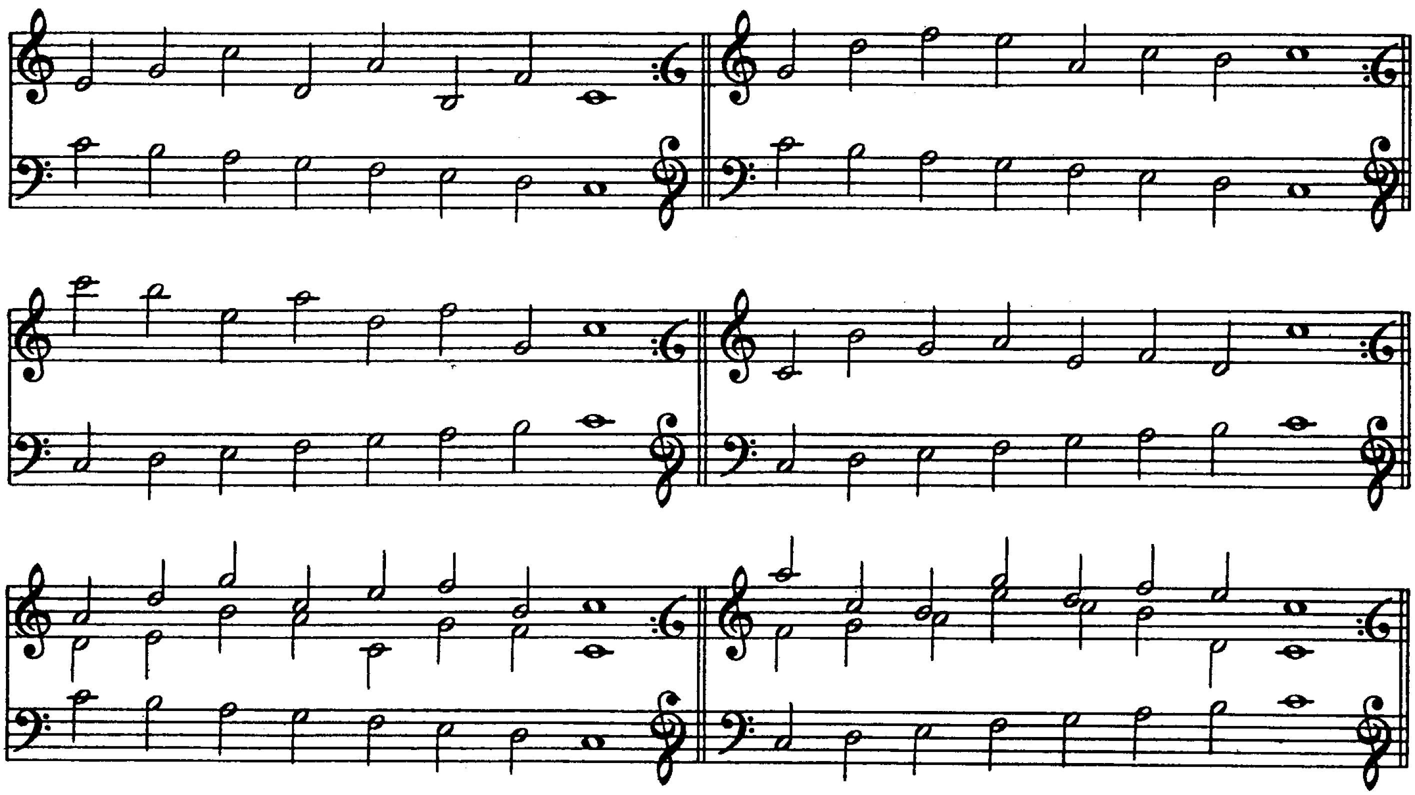



# Double Notes
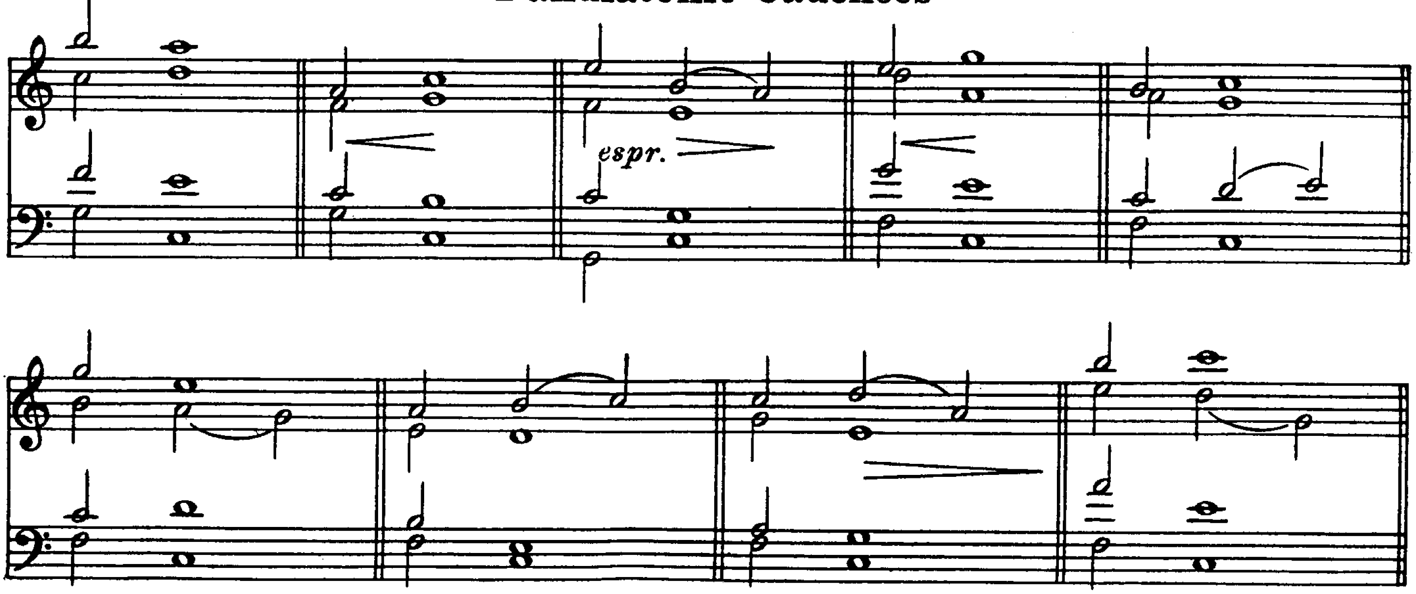


# Triple Notes
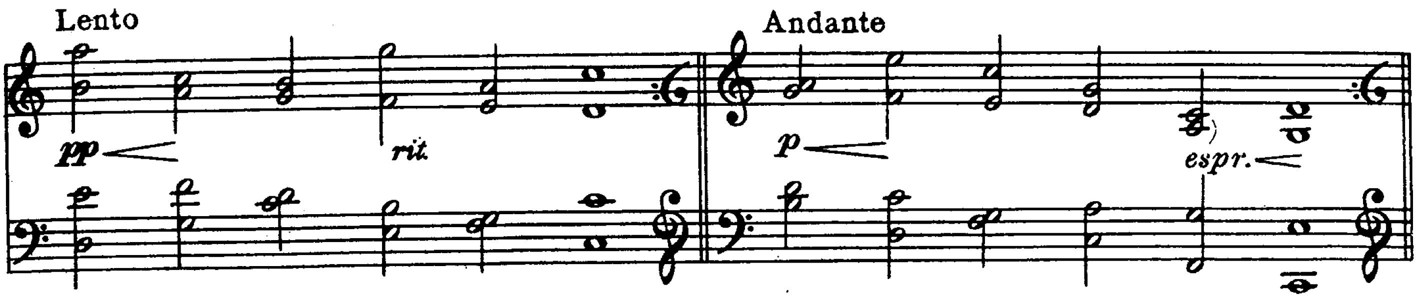


# Pandiatonic Counterpoint
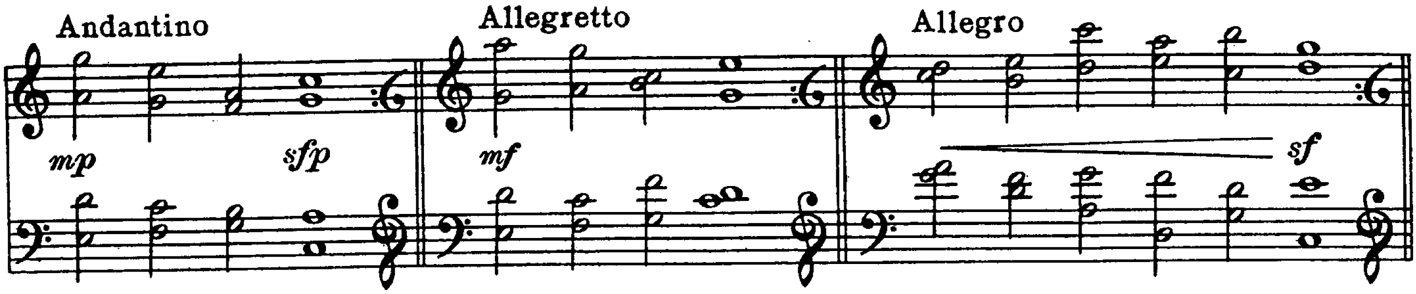


# Pandiatonic Cadences
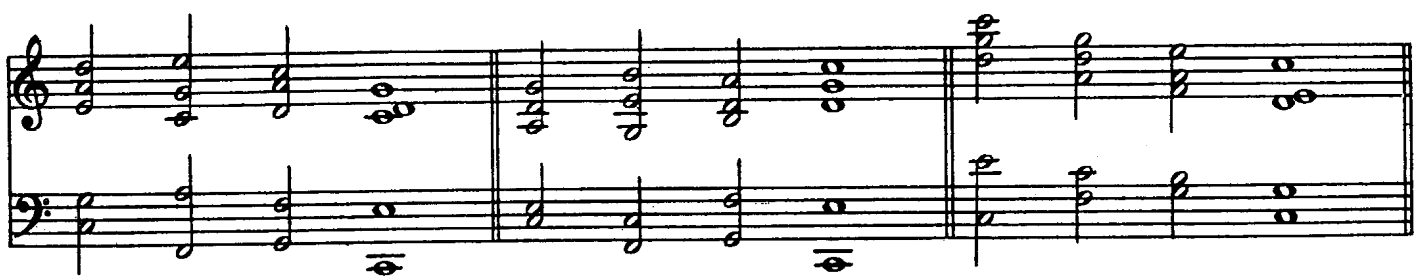


## Pandiatonic Harmony in Four Parts
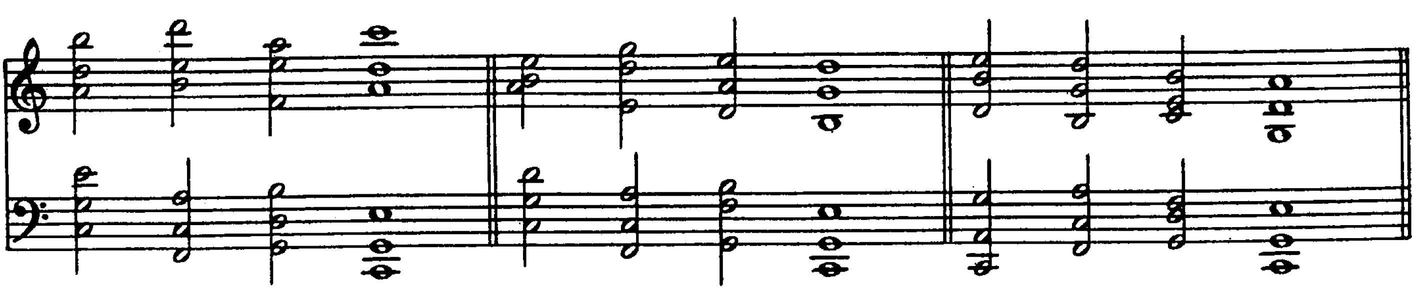






## Pandiatonic Harmony in Five Parts

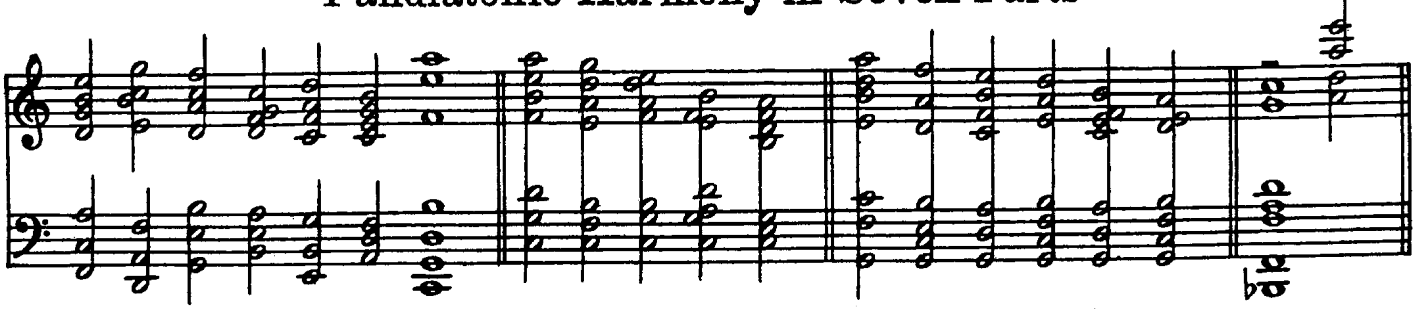


## Pandiatonic Harmony in Six Parts
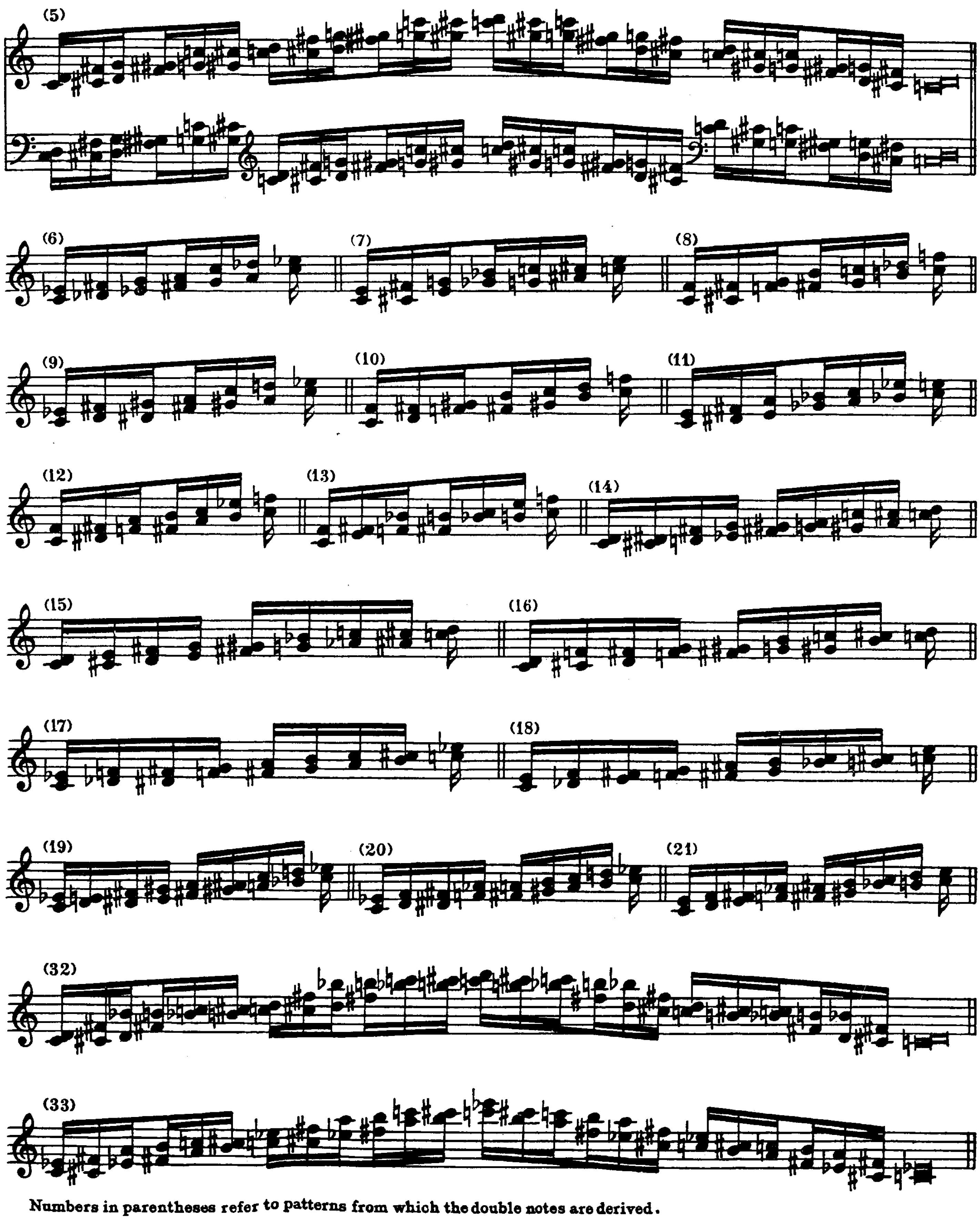


## Pandiatonic Harmony in Seven Parts

[Roy Harris: *Slumber*]
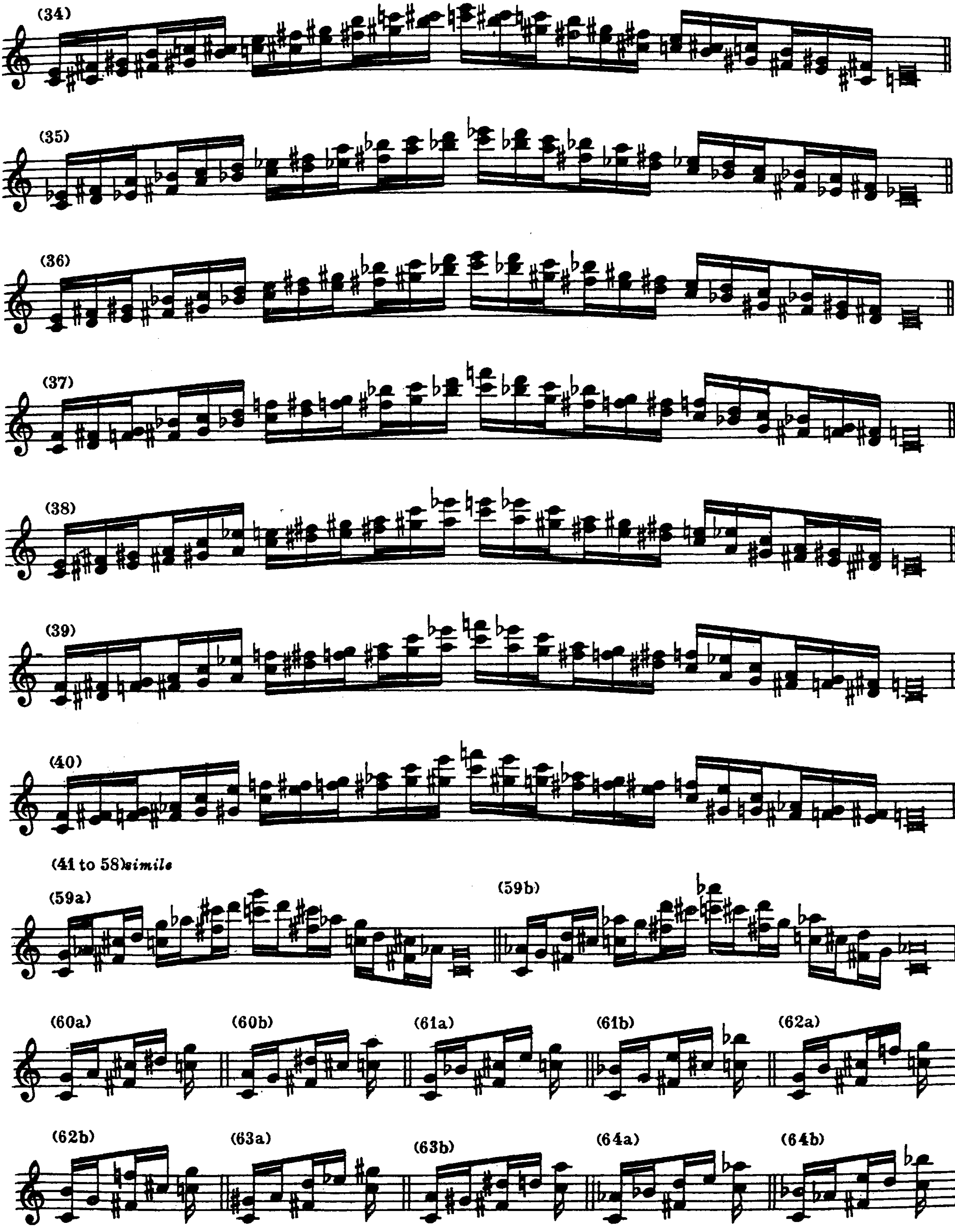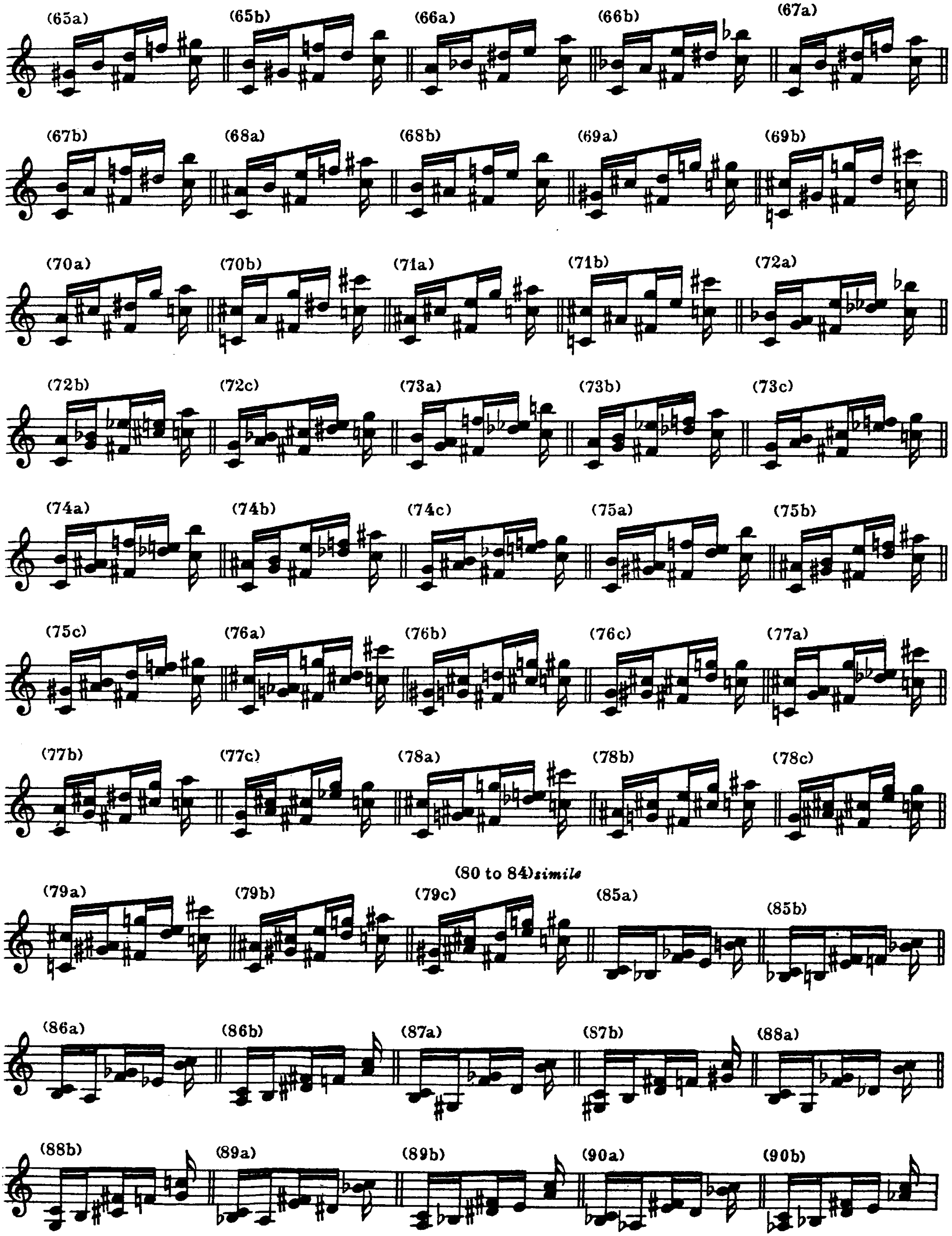


# Double Notes
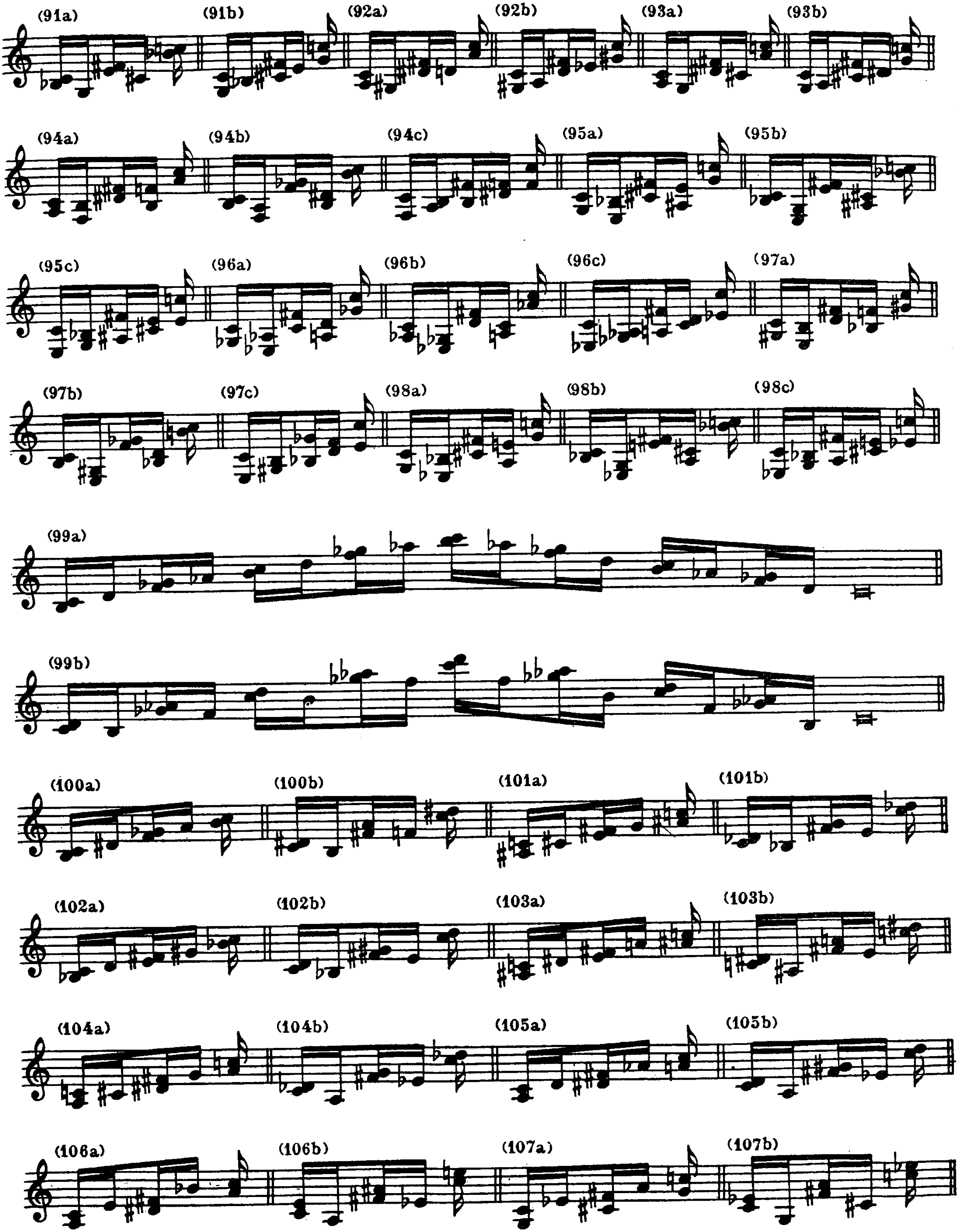
## Tritone Progression
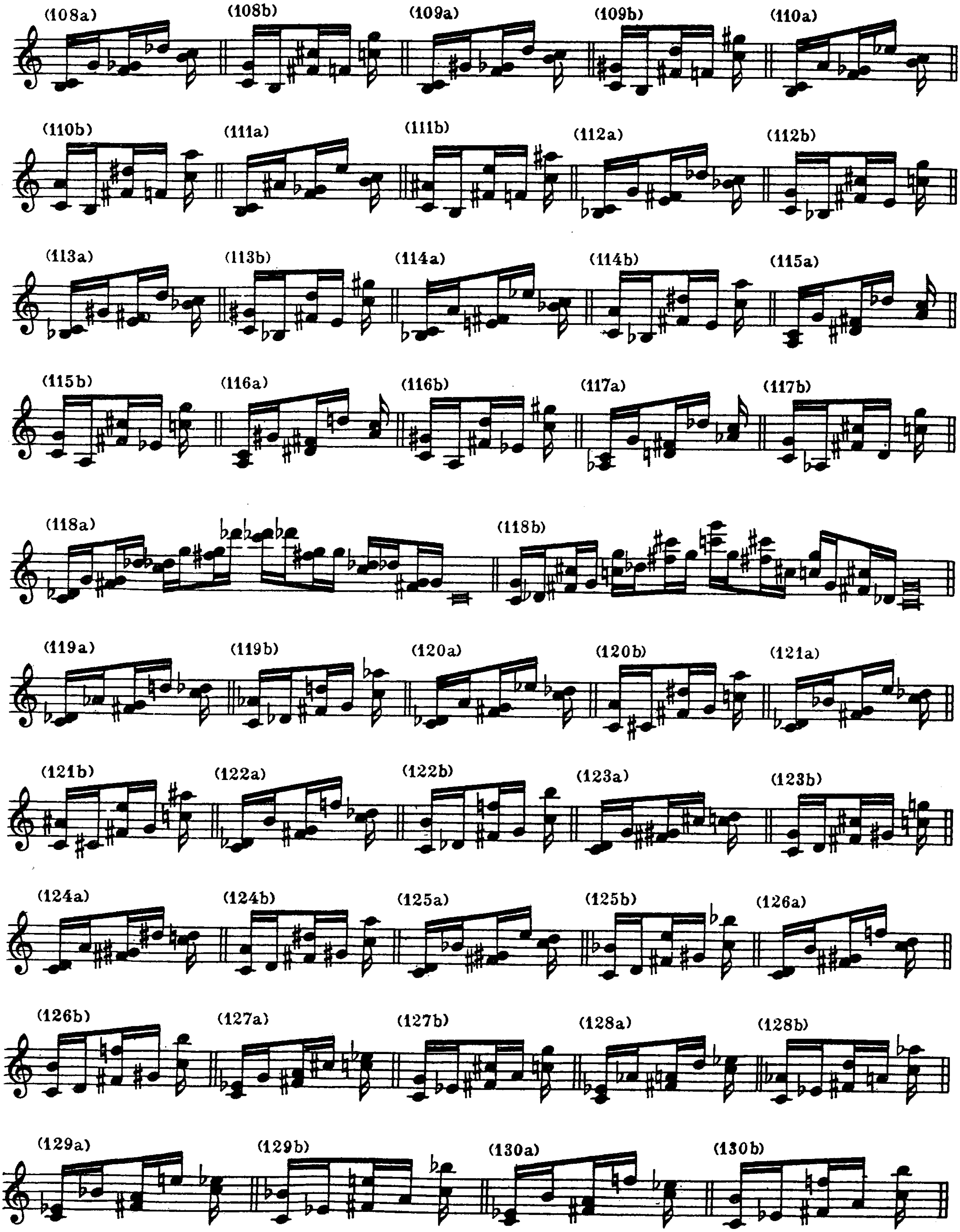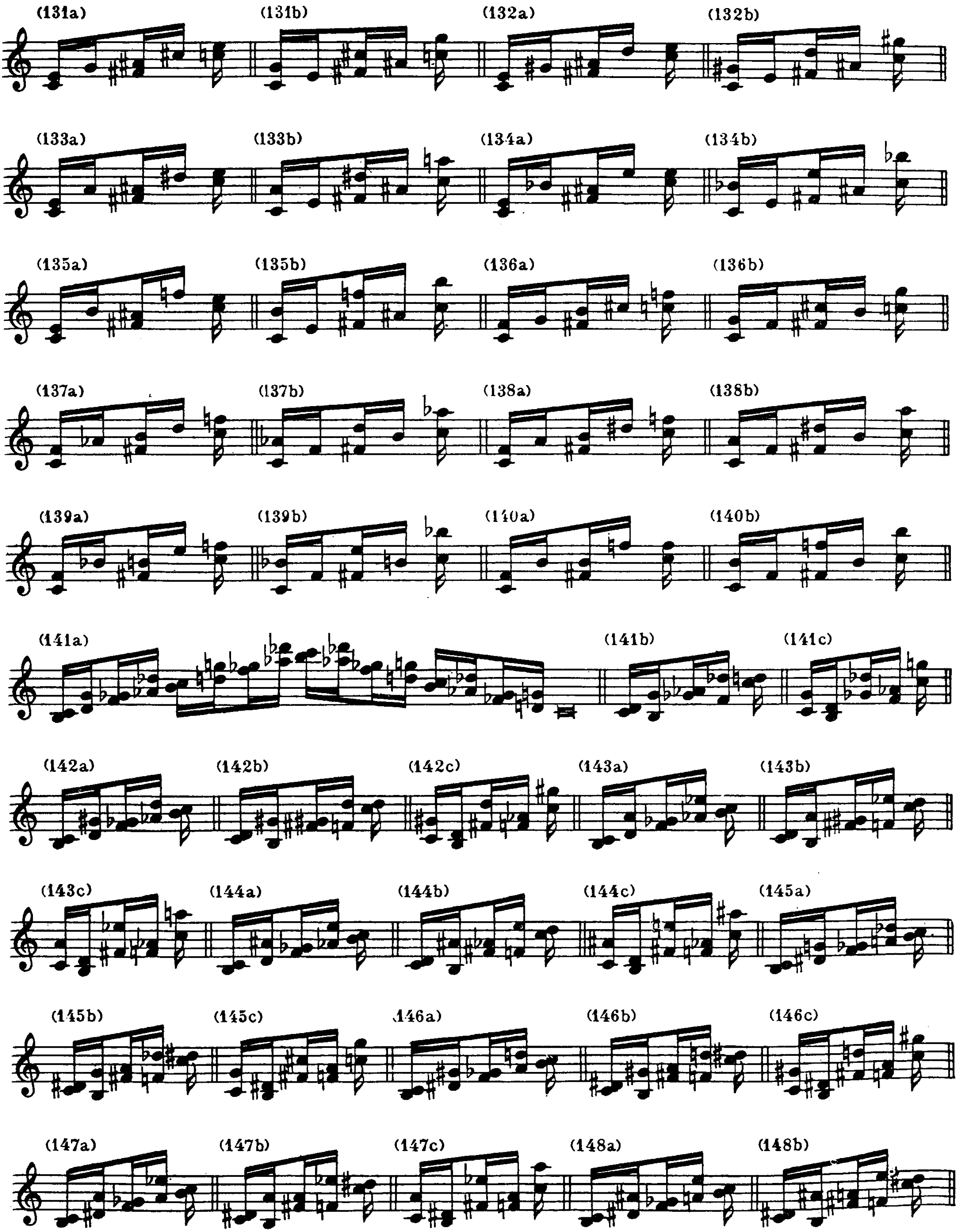



**Numbers in parentheses refer to patterns from which the double notes are derived.**

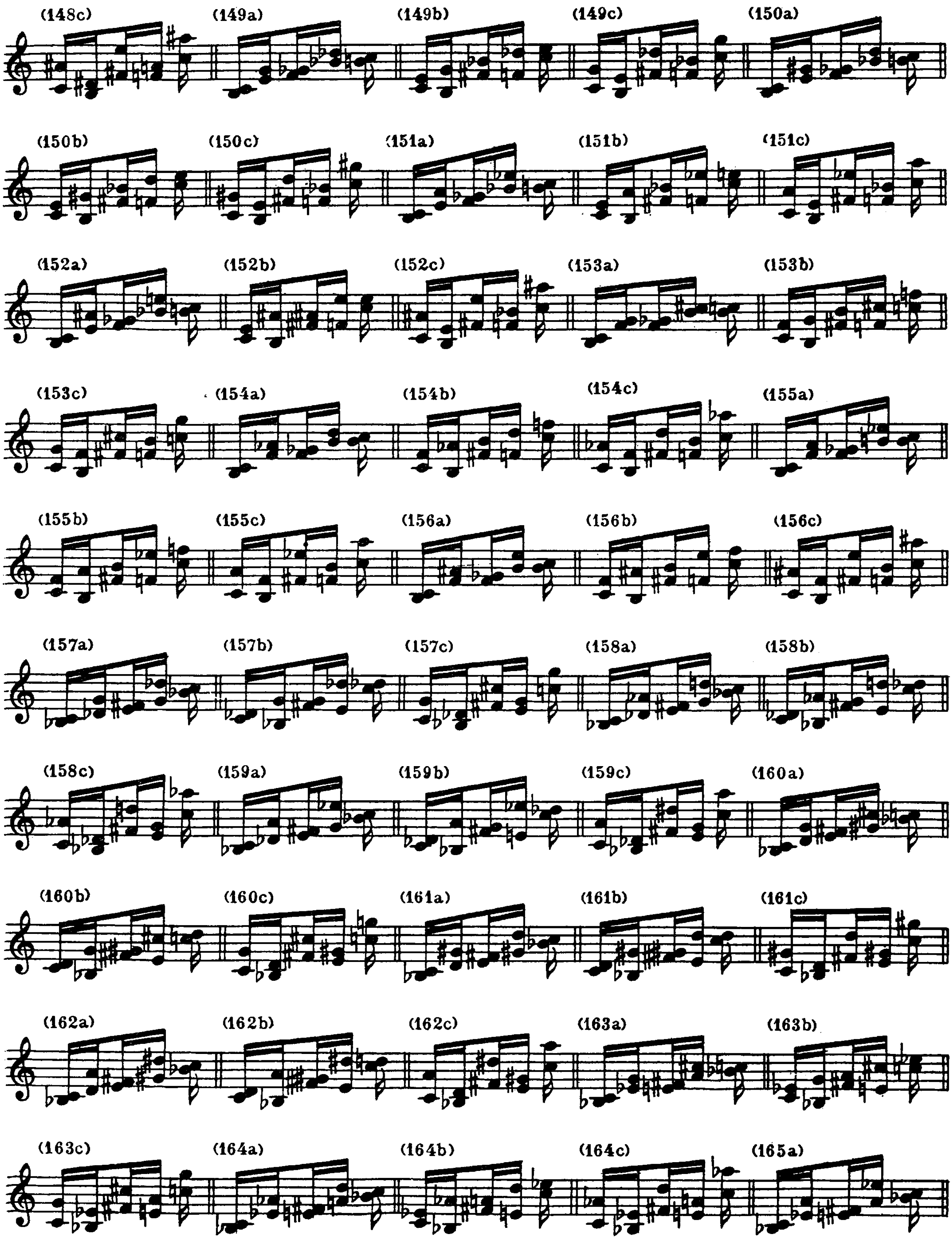

(34)
(35)
(36)
(37)
(38)
(39)
(40)
(41 to 58) *simile*
(59a)
(59b)
(60a)
(60b)
(61a)
(61b)
(62a)
(62b)
(63a)
(63b)
(64a)
(64b)
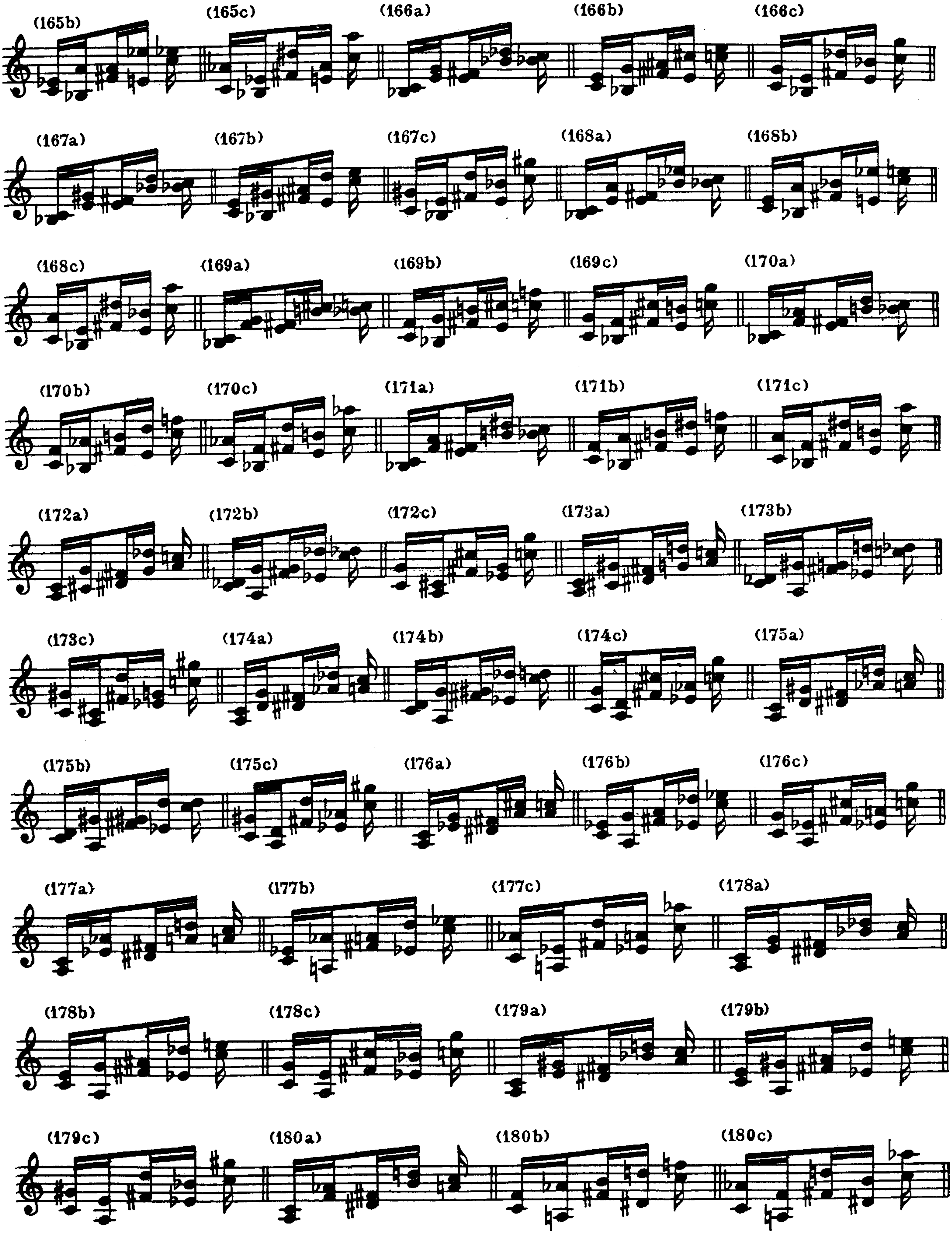

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(75c)
(76a)
(76b)
(76c)
(77a)
(77b)
(77c)
(78a)
(78b)
(78c)
(80 to 84) simile
(79a)
(79b)
(79c)
(85a)
(85b)
(86a)
(86b)
(87a)
(87b)
(88a)
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(89a)
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(106b)
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(107b)
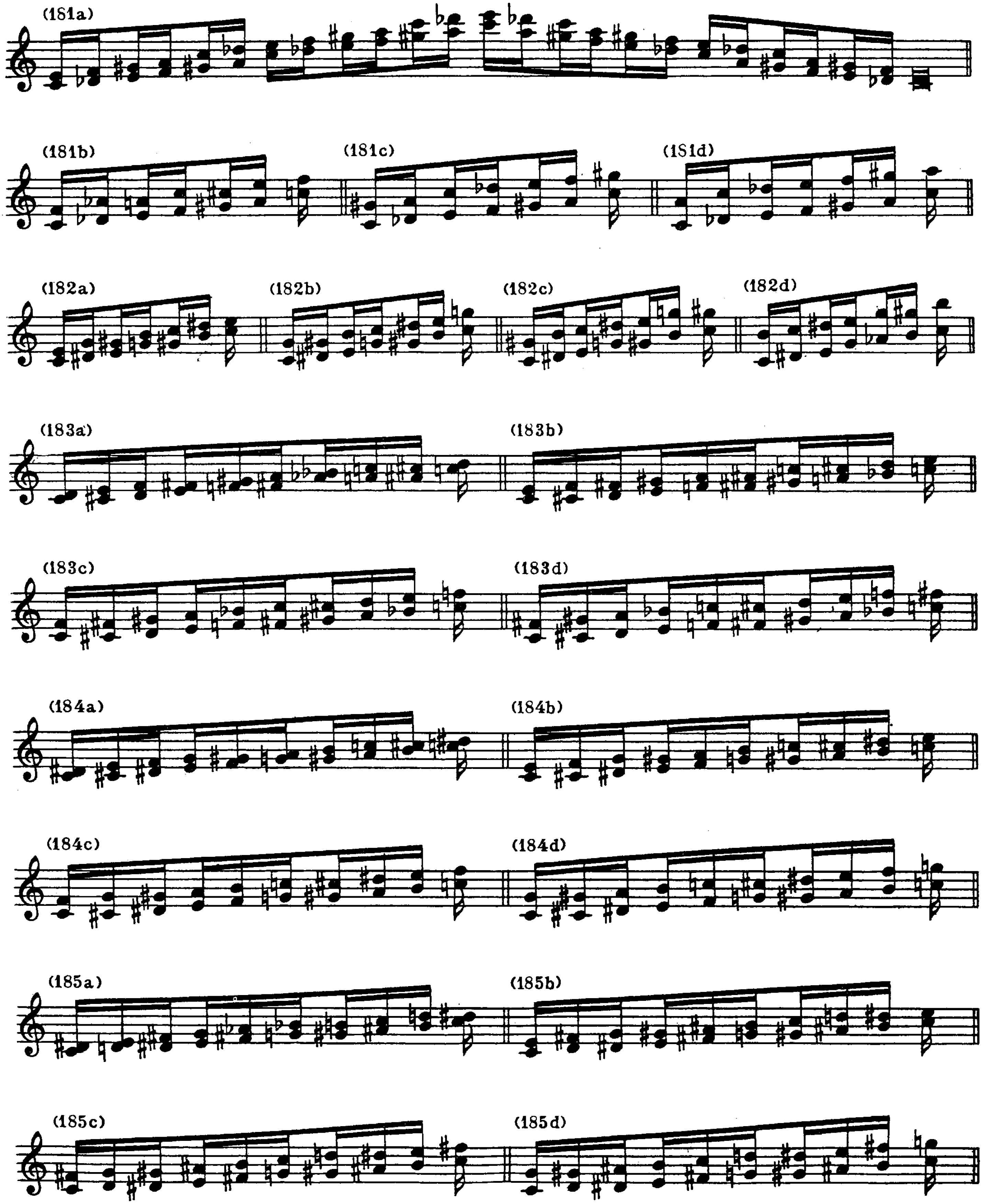

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(130b)
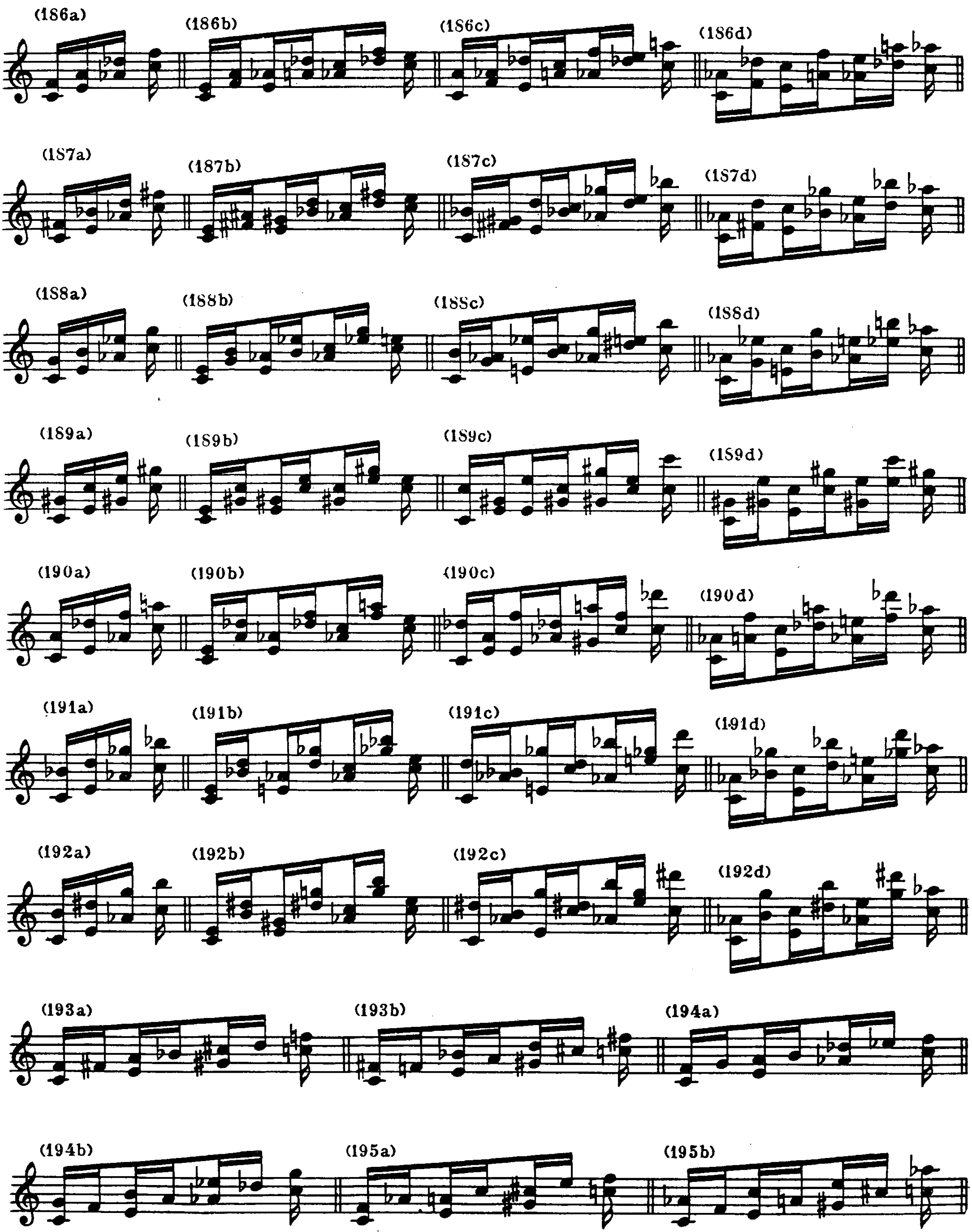

(131a)
(131b)
(132a)
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(141c)
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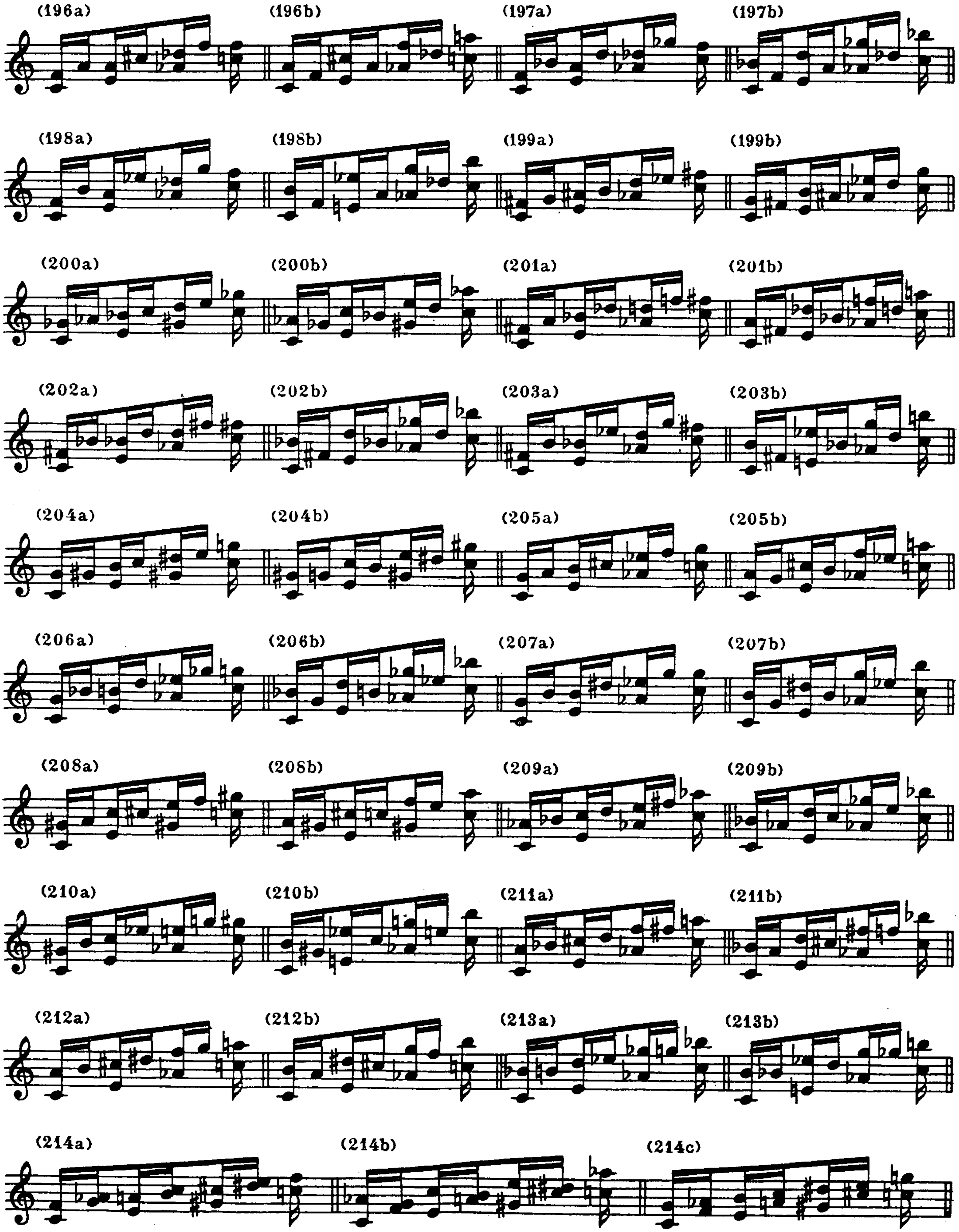

(148c)
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(151b)
(151c)
(152a)
(152b)
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(162a)
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(163a)
(163b)
(163c)
(164a)
(164b)
(164c)
(165a)
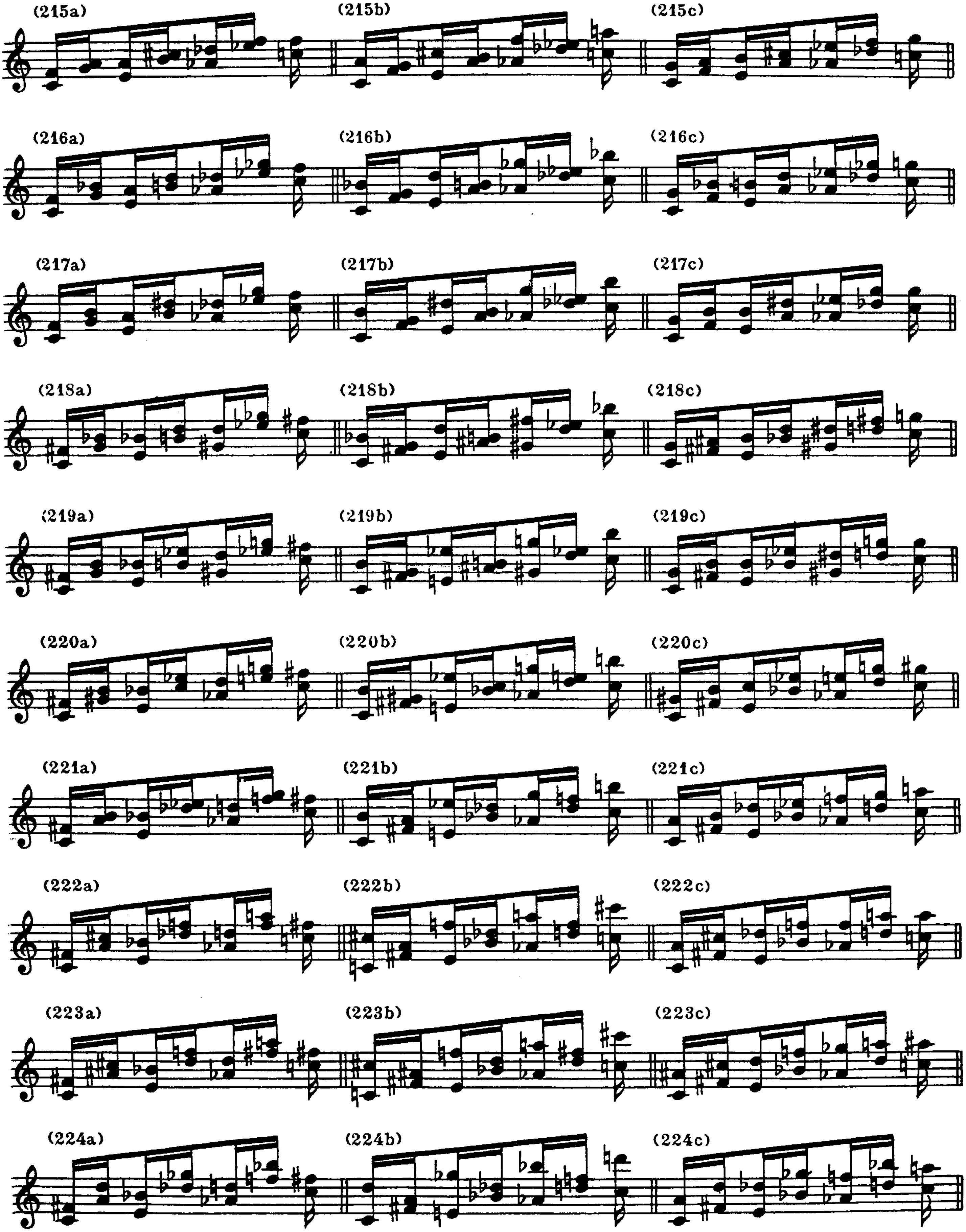

(165b)
(165c)
(166a)
(166b)
(166c)
(167a)
(167b)
(167c)
(168a)
(168b)
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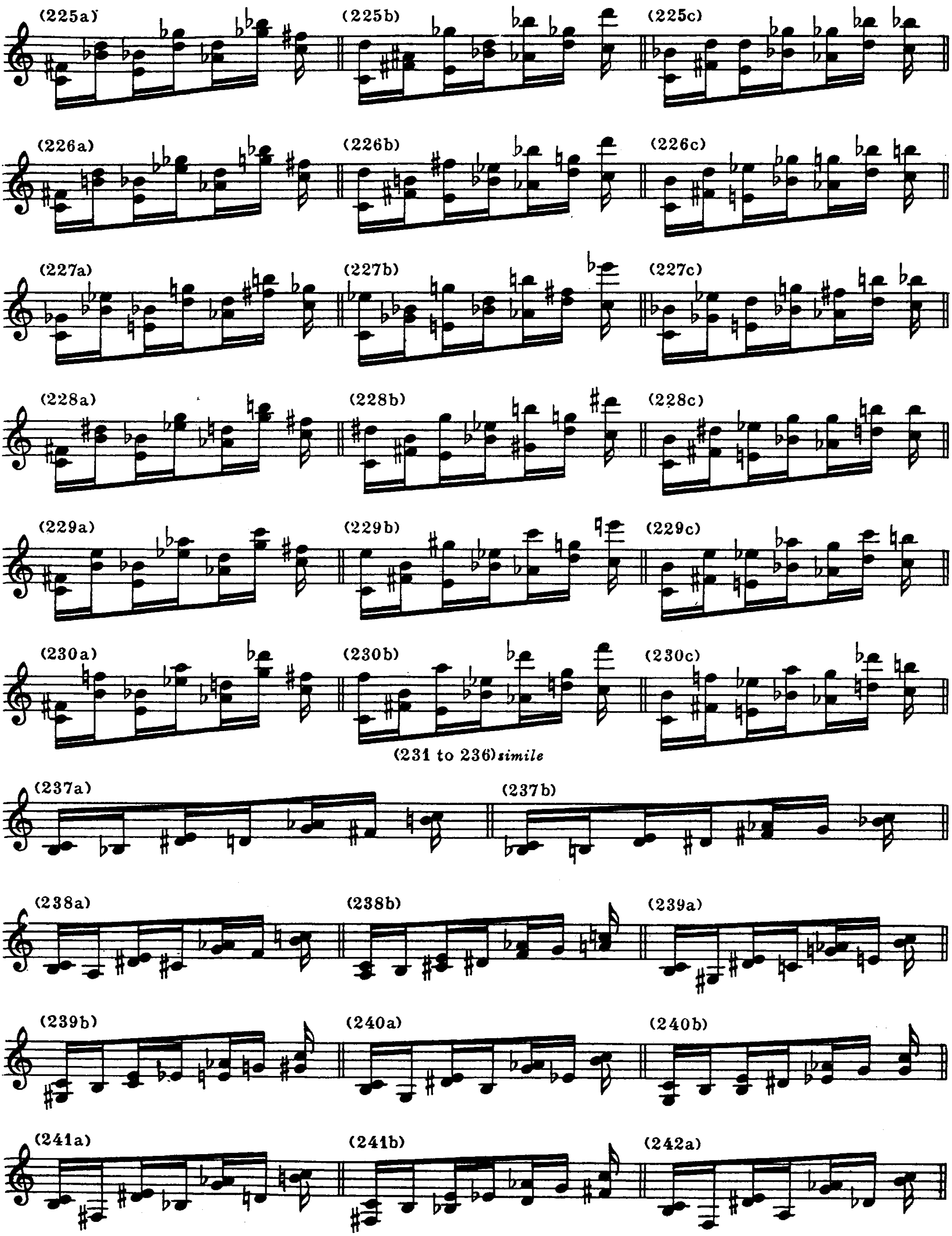
# Ditone Progression
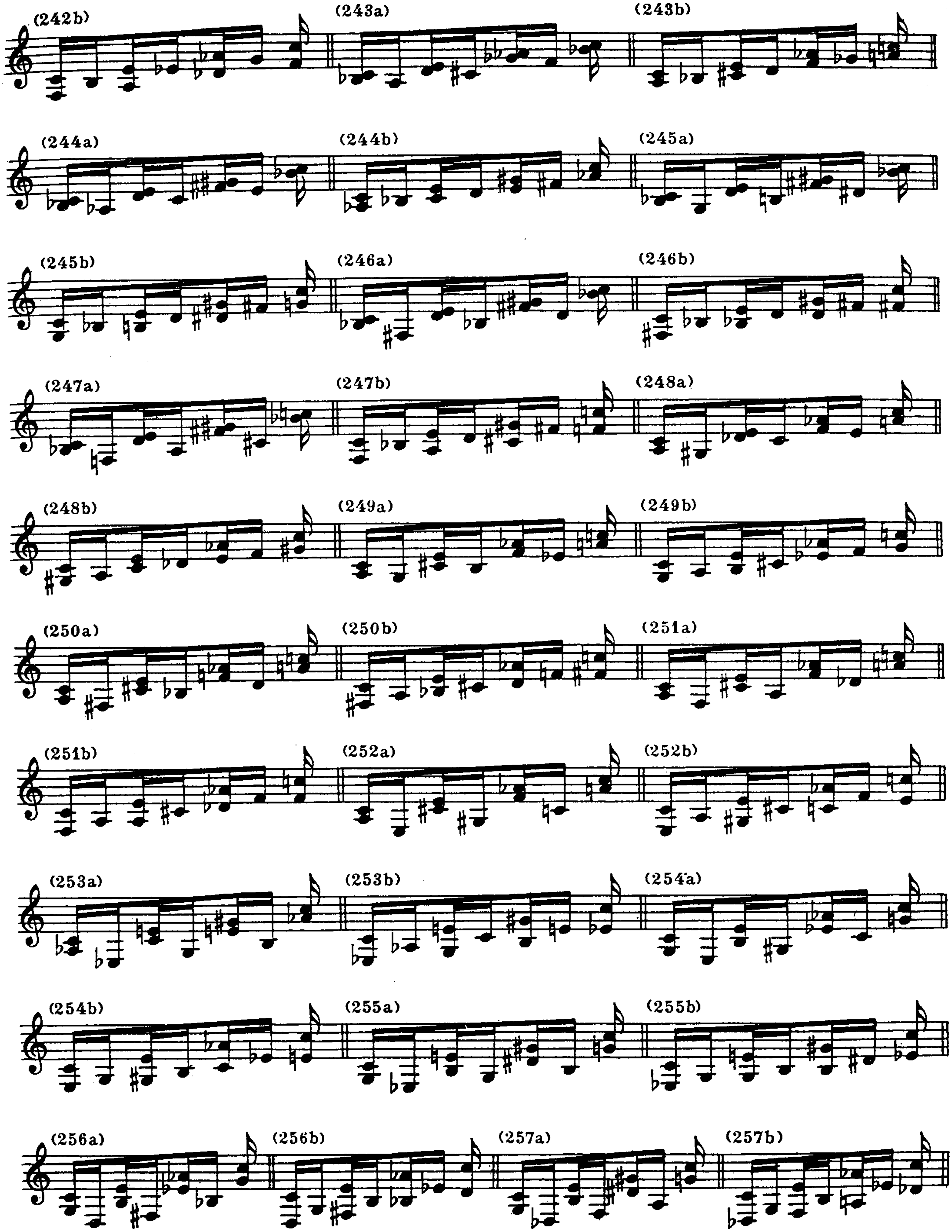



(186a)
(186b)
(186c)
(186d)
(187a)
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(187c)
(187d)
(188a)
(188b)
(188c)
(188d)
(189a)
(189b)
(189c)
(189d)
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(190b)
(190c)
(190d)
(191a)
(191b)
(191c)
(191d)
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(194b)
(195a)
(195b)
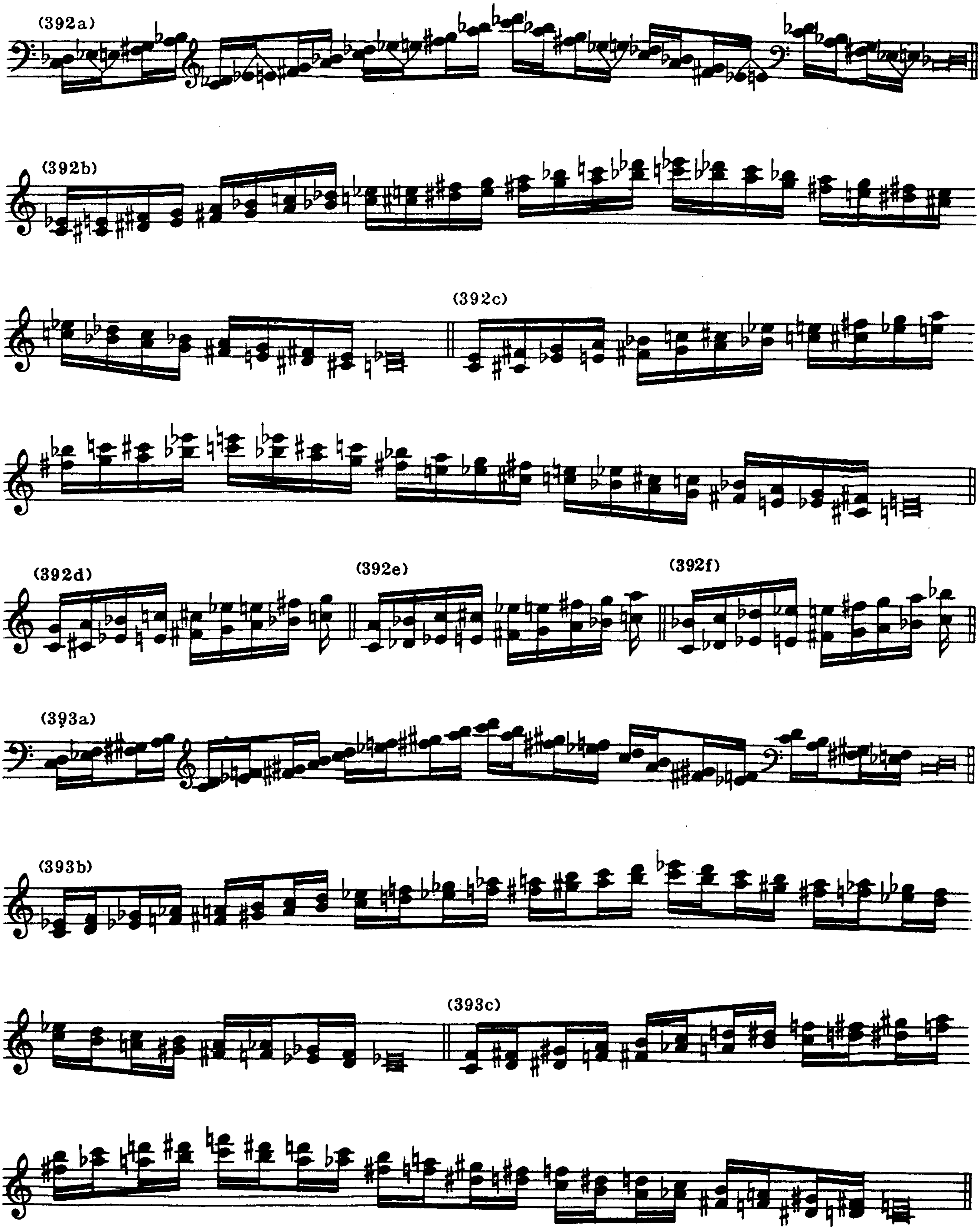

(196a)
(196b)
(197a)
(197b)
(198a)
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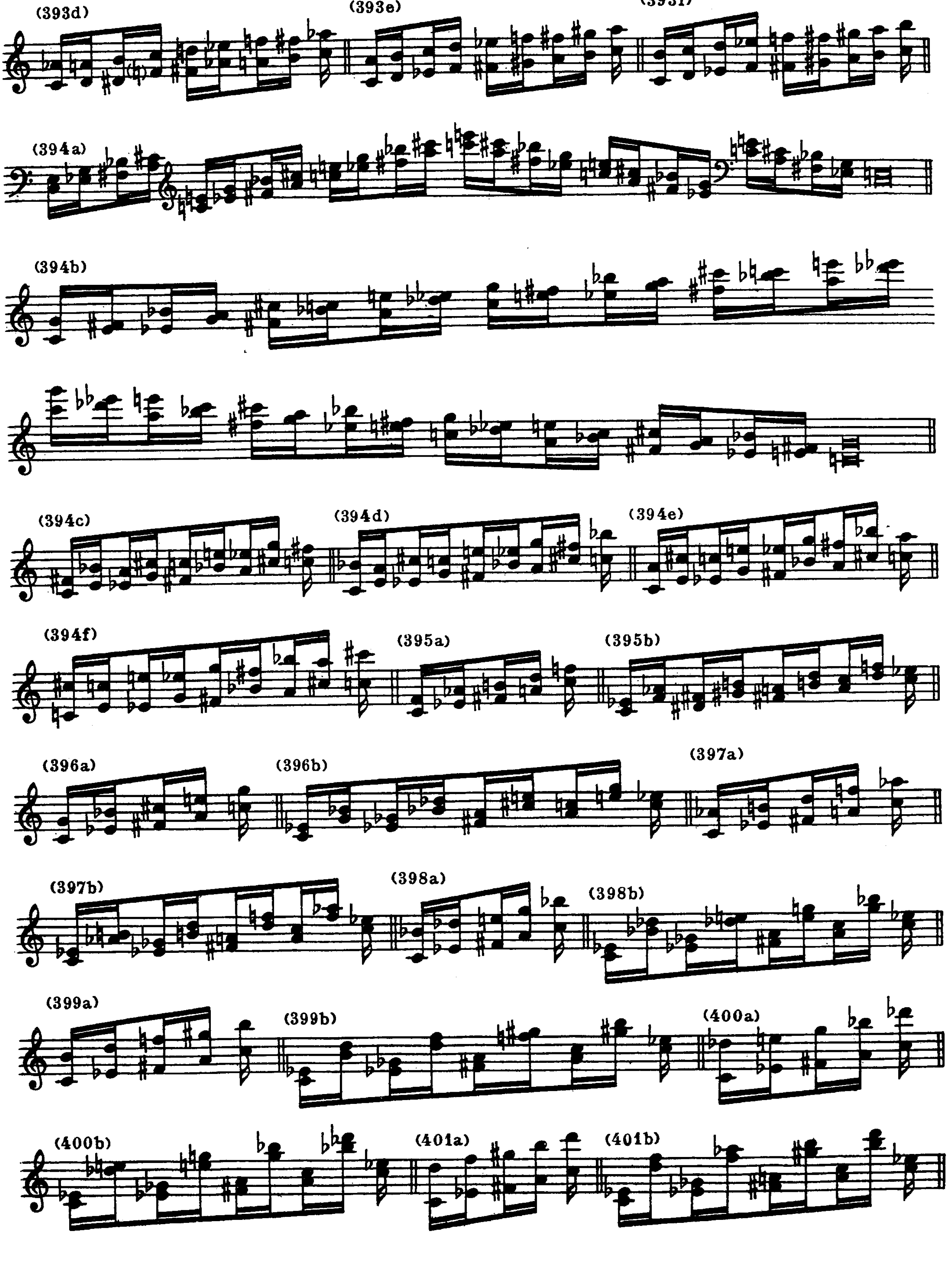

(215a)
(215b)
(215c)
(216a)
(216b)
(216c)
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(217c)
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(223c)
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(224b)
(224c)

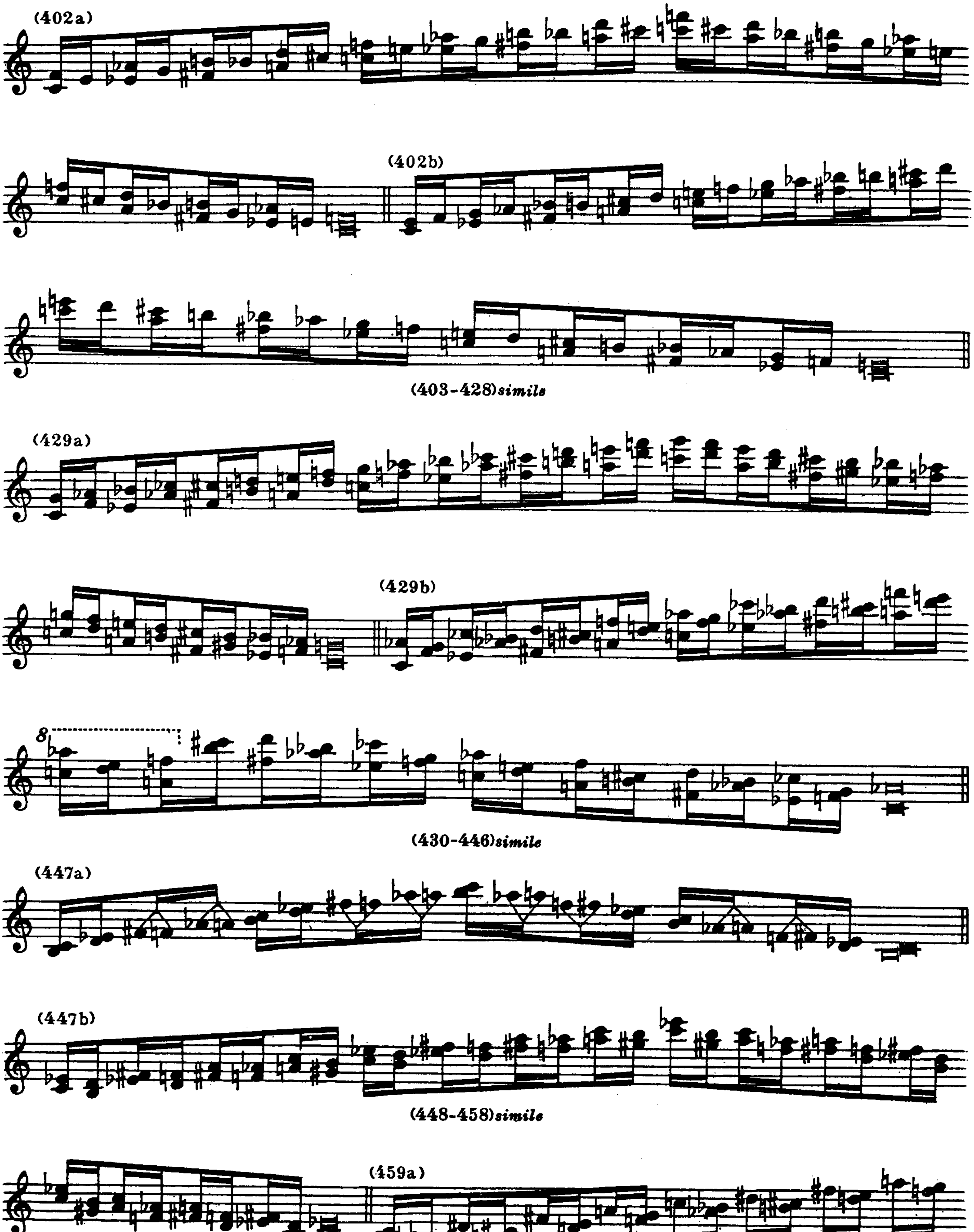

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(225c)
(226a)
(226b)
(226c)
(227a)
(227b)
(227c)
(228a)
(228b)
(228c)
(229a)
(229b)
(229c)
(230a)
(230b)
(230c)
(231 to 236) simile
(237a)
(237b)
(238a)
(238b)
(239a)
(239b)
(240a)
(240b)
(241a)
(241b)
(242a)
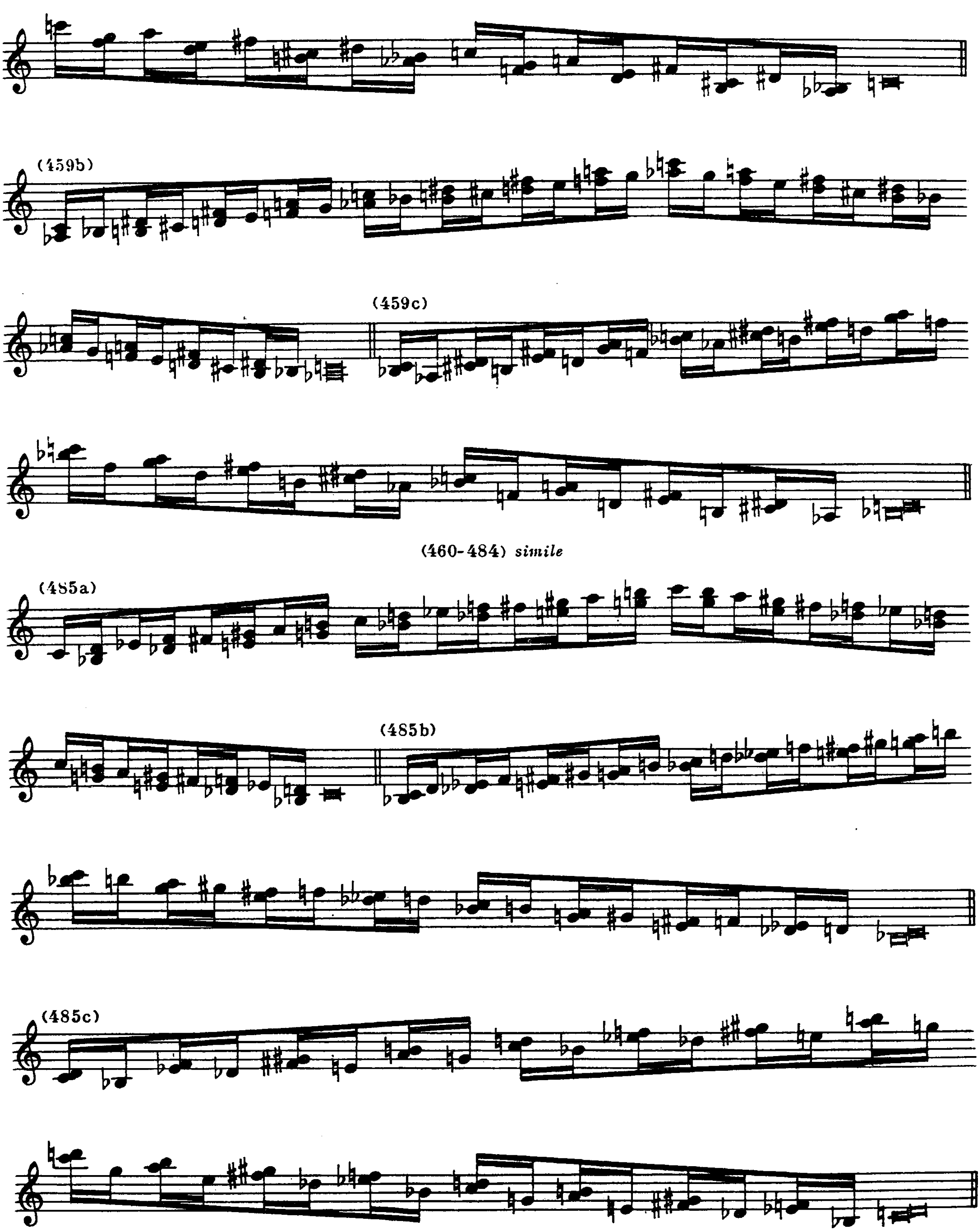

(242b)
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(243b)
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(257a)
(257b)
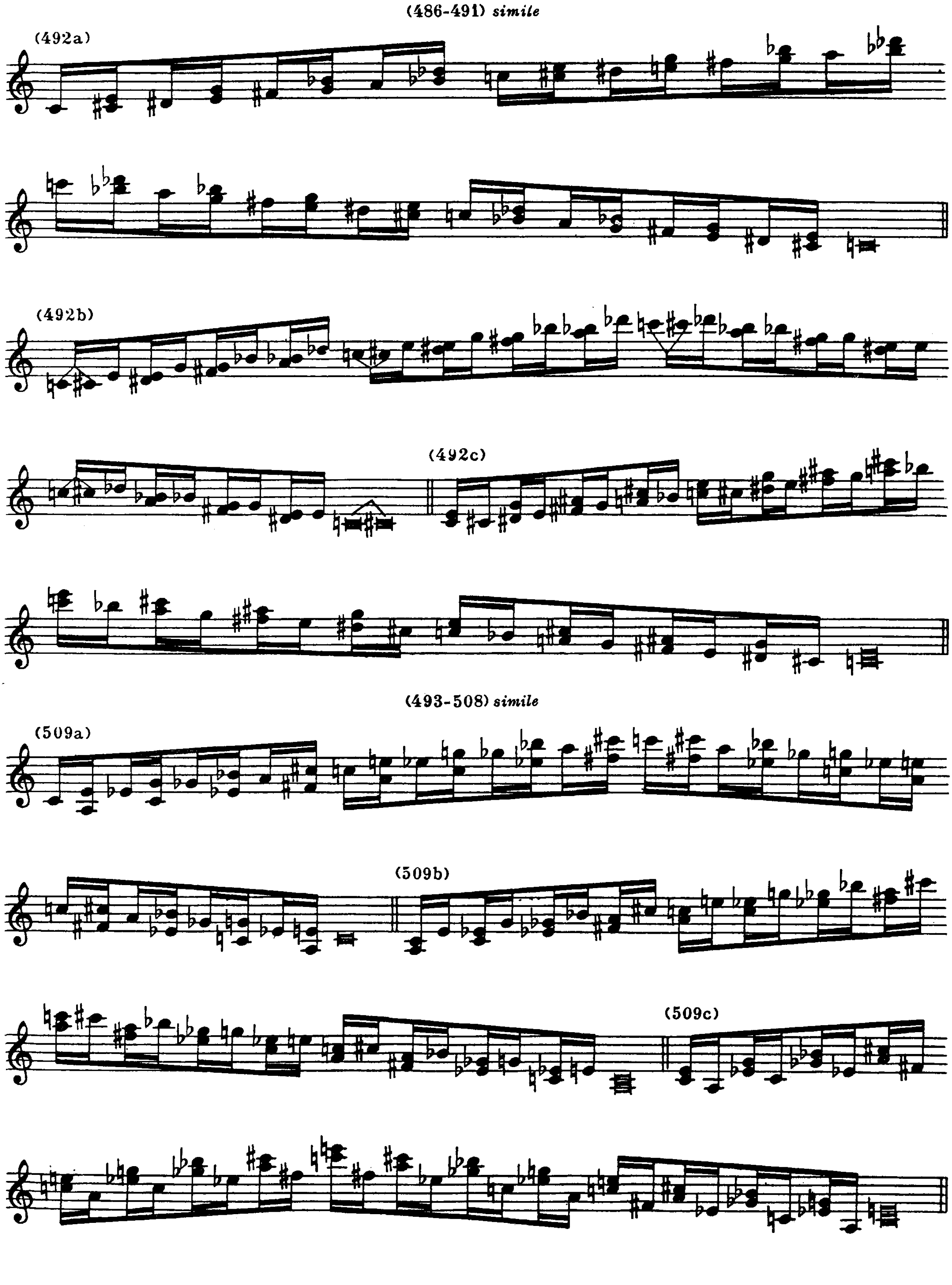
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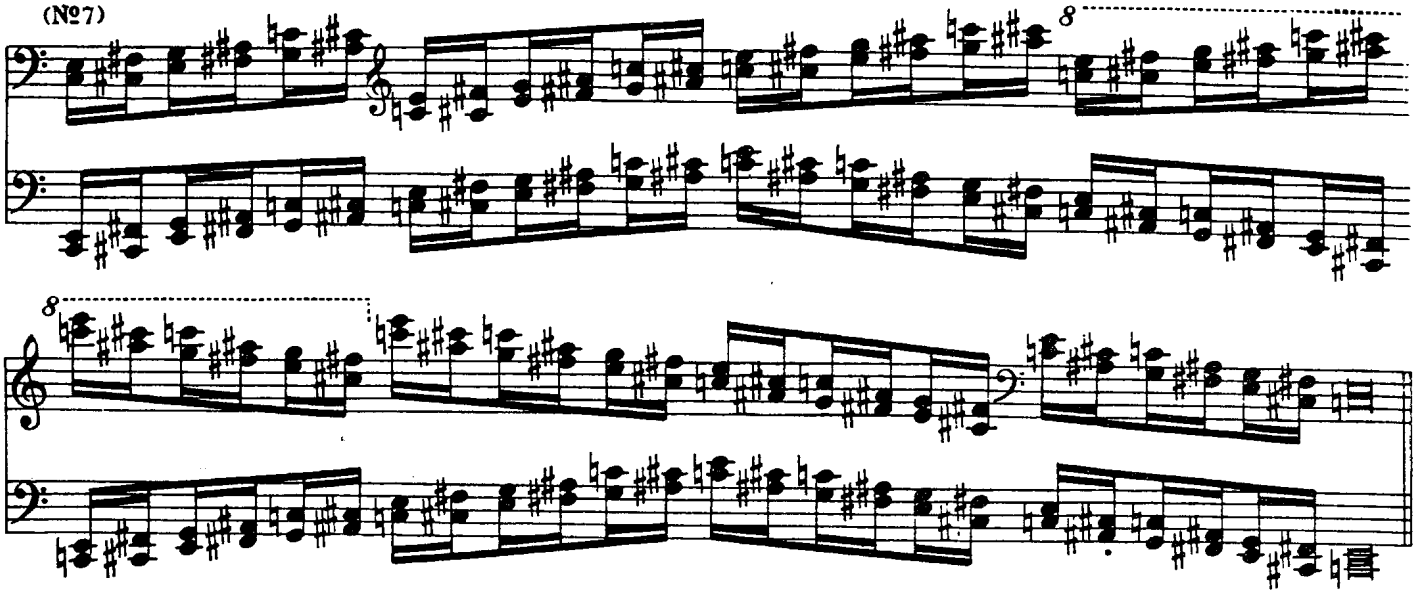



(393d)
(393e)
(393f)
(394a)
(394b)
(394c)
(394d)
(394e)
(394f)
(395a)
(395b)
(396a)
(396b)
(397a)
(397b)
(398a)
(398b)
(399a)
(399b)
(400a)
(400b)
(401a)
(401b)


(402a)
(402b)
(403-428)simile
(429a)
(429b)
8
(430-446)simile
(447a)
(447b)
(448-458)simile
(459a)
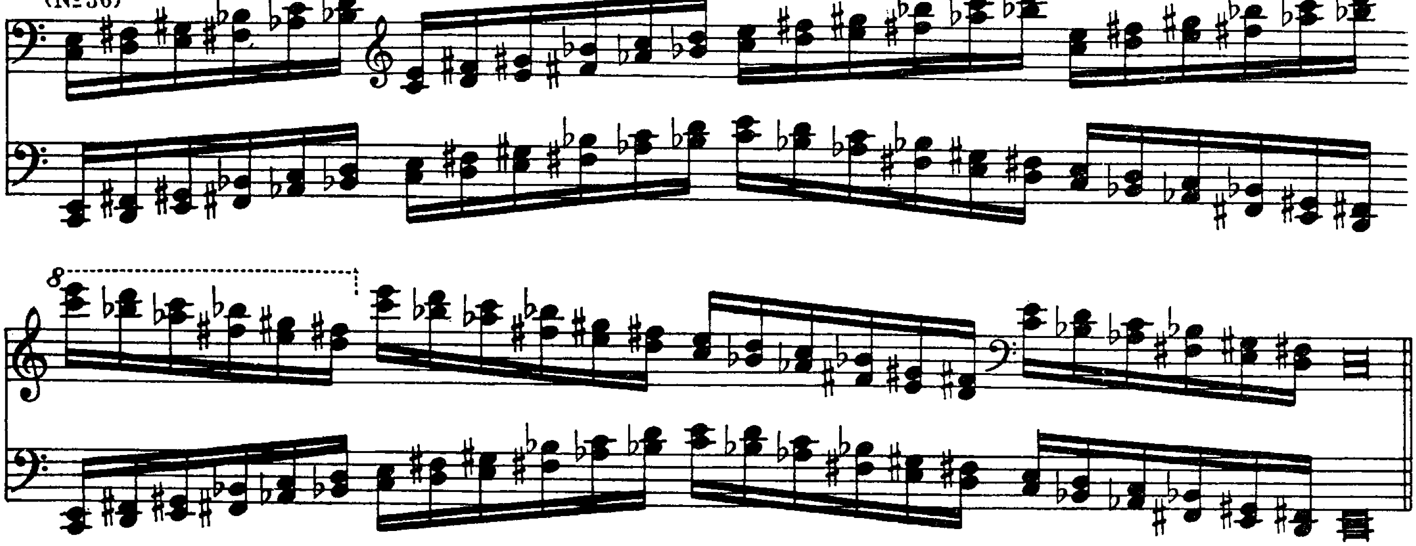

(459b)
(459c)
(460-484) simile
(485a)
(485b)
(485c)


(486-491) simile
(492a)
(492b)
(492c)
(493-508) simile
(509a)
(509b)
(509c)
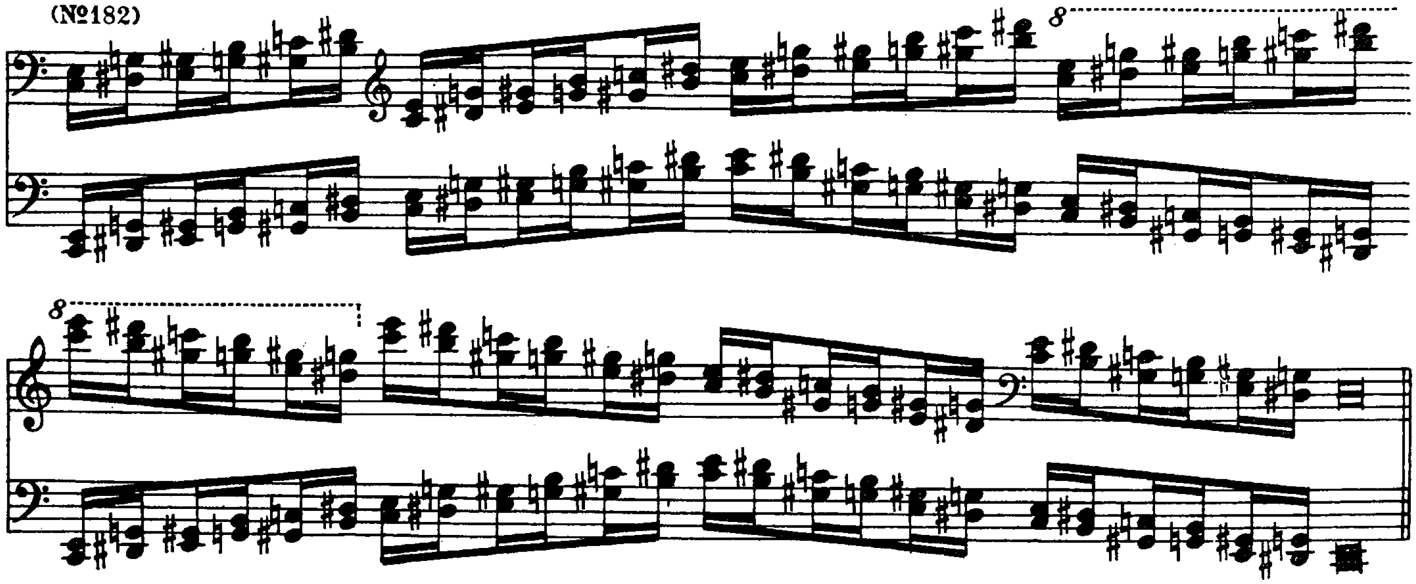
(Nº7)
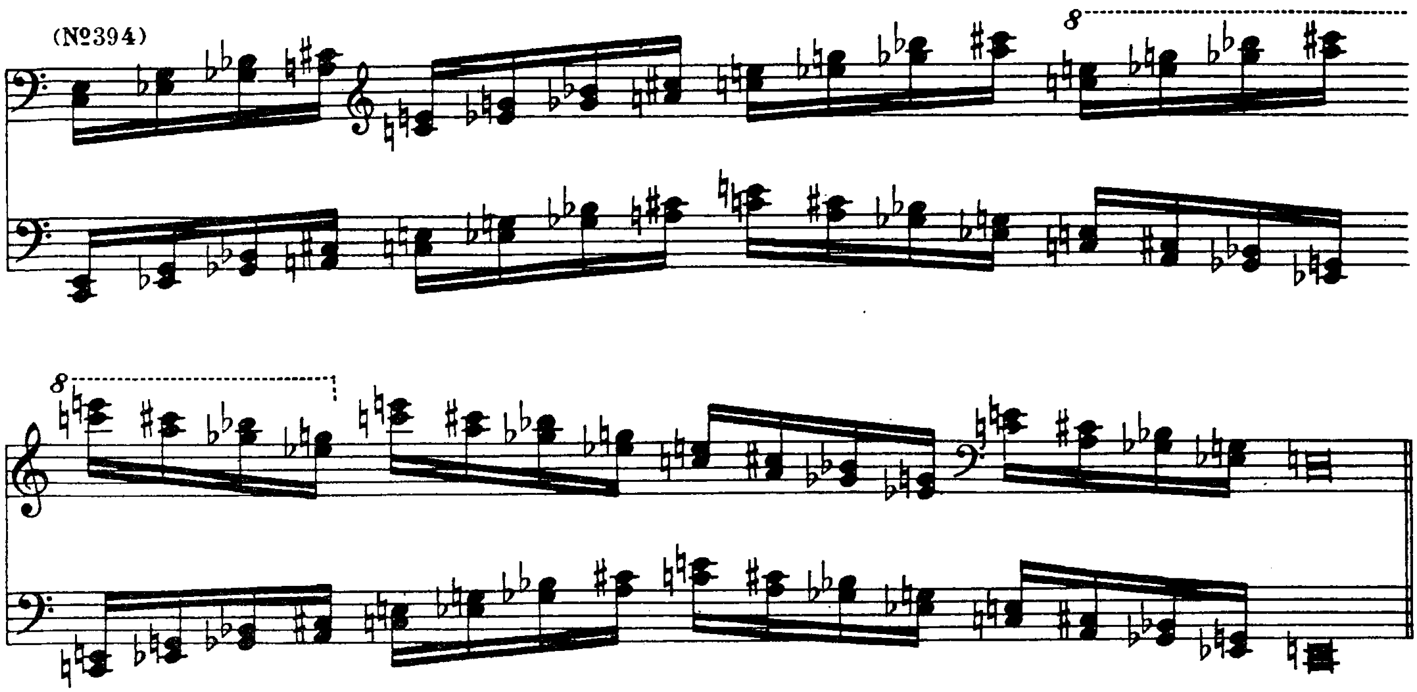


Whole-Tone Scale
(Nº36)
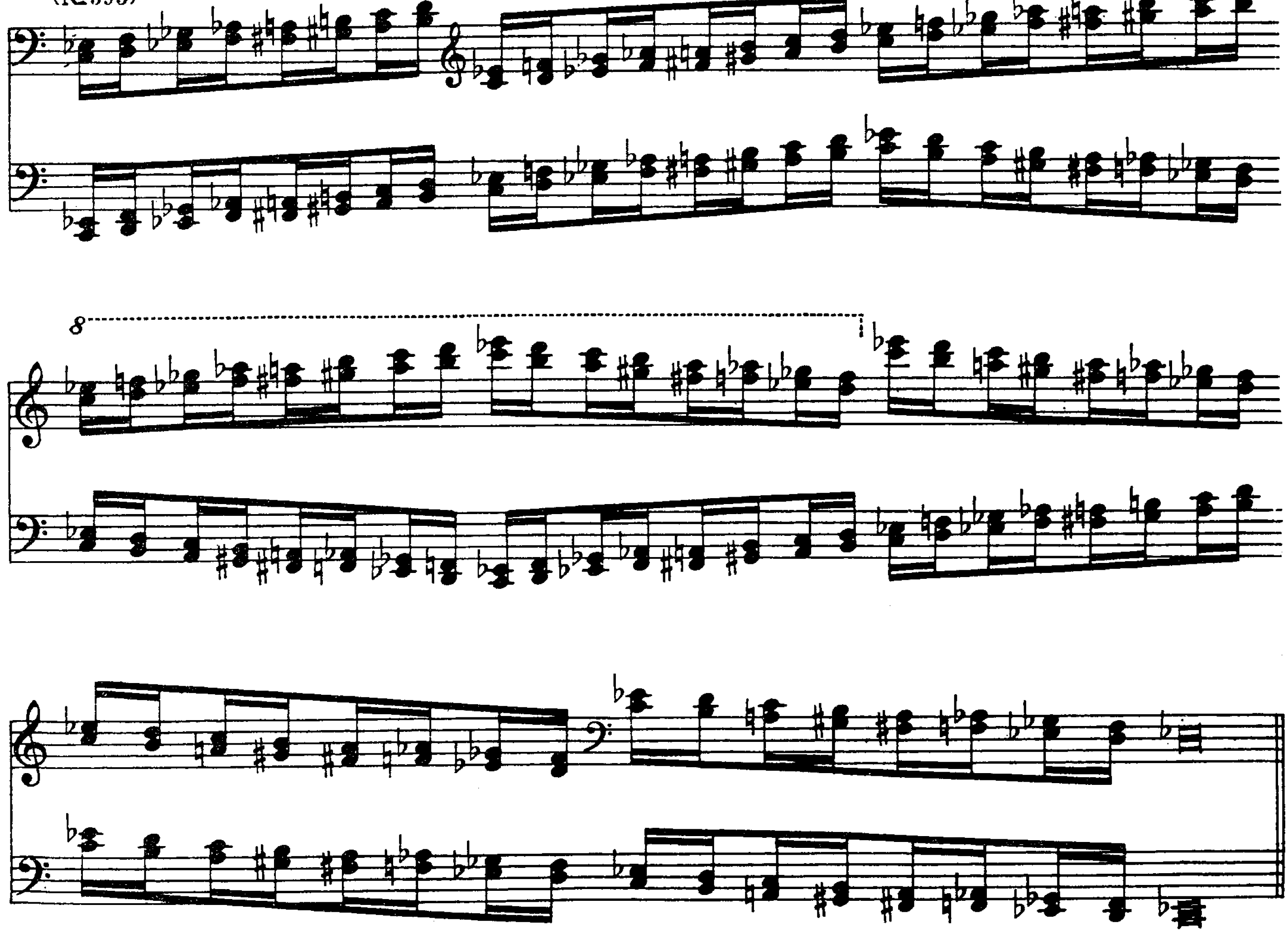


(Nº182)
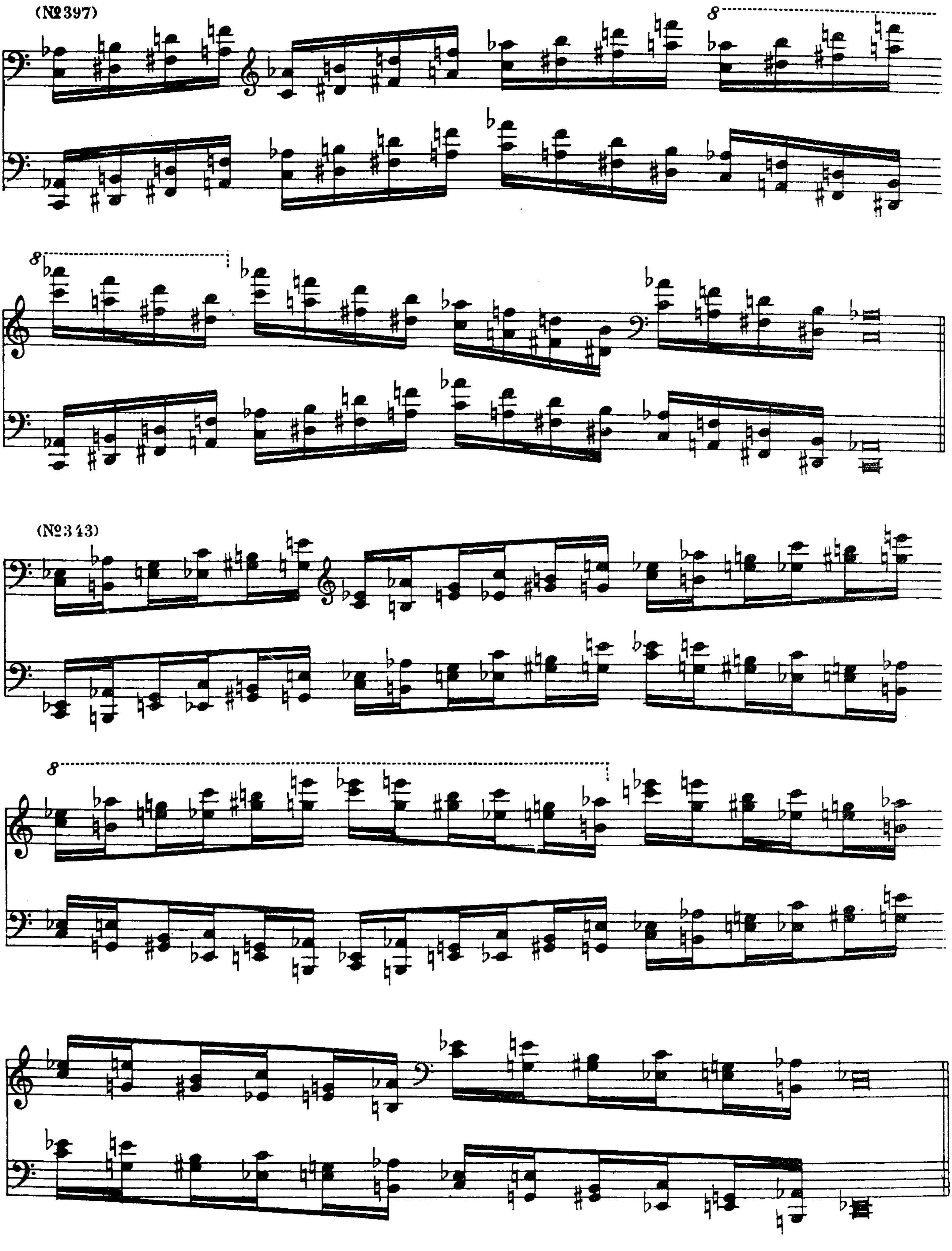


(№394)
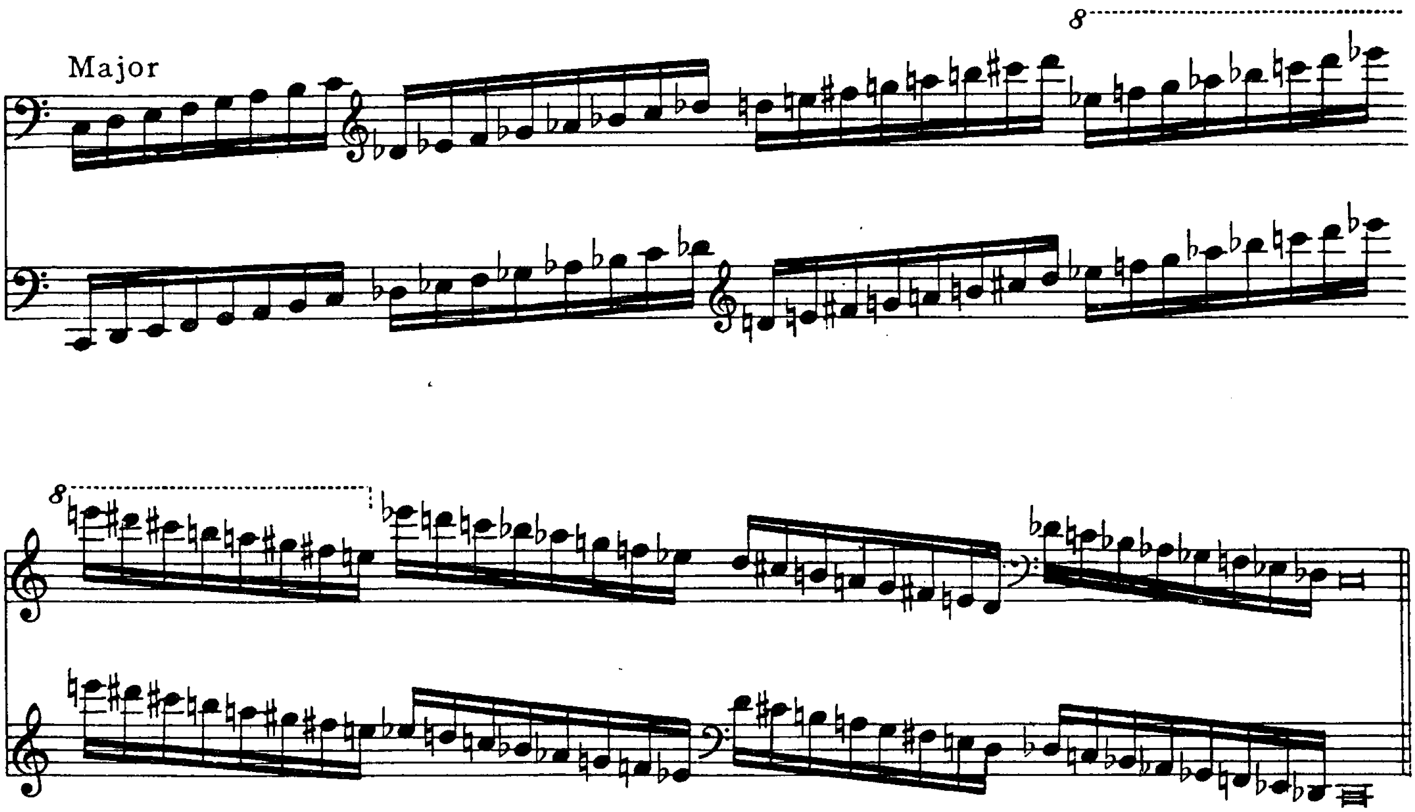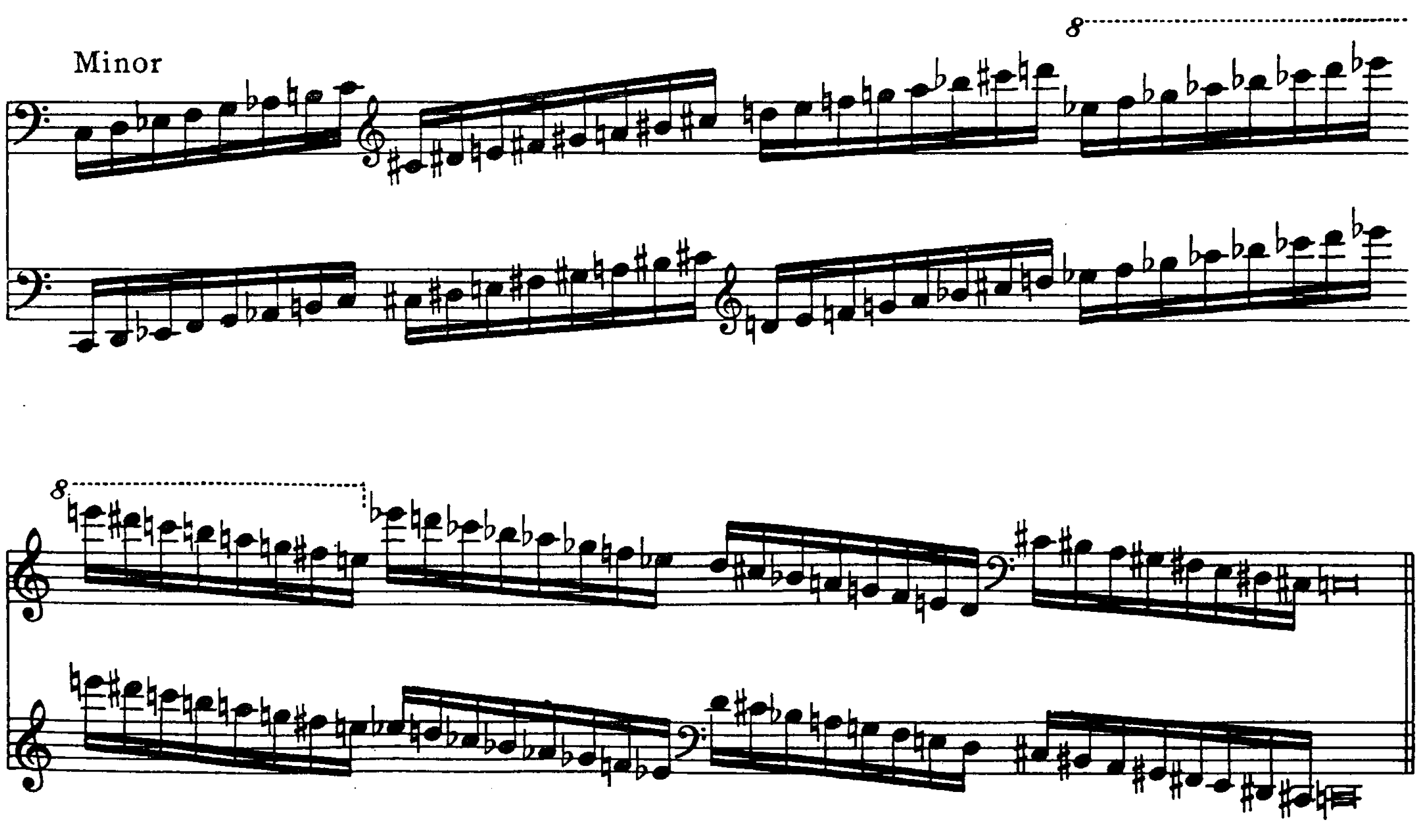


(№393)
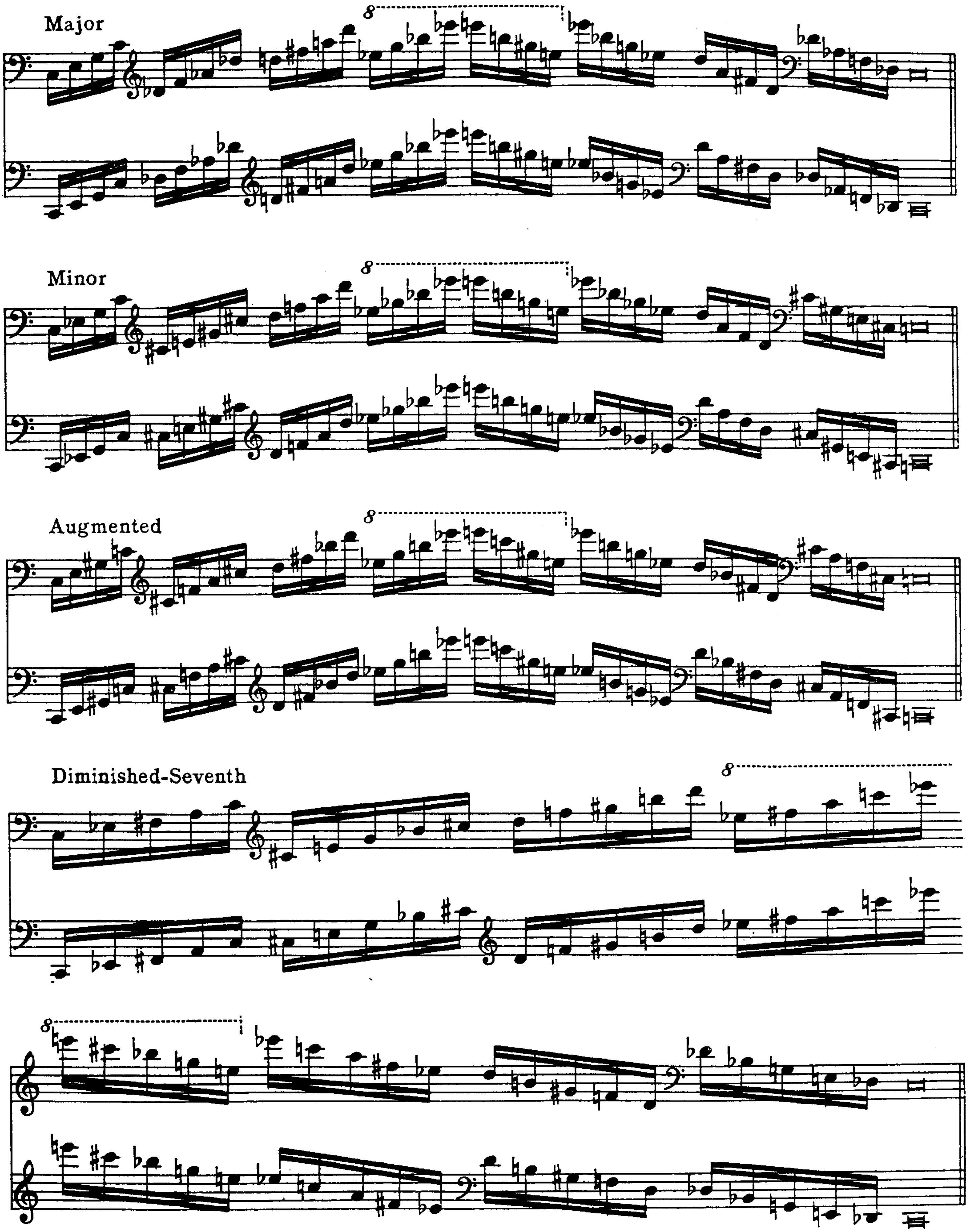



(№397)
(№343)

# Plural Scales and Arpeggios
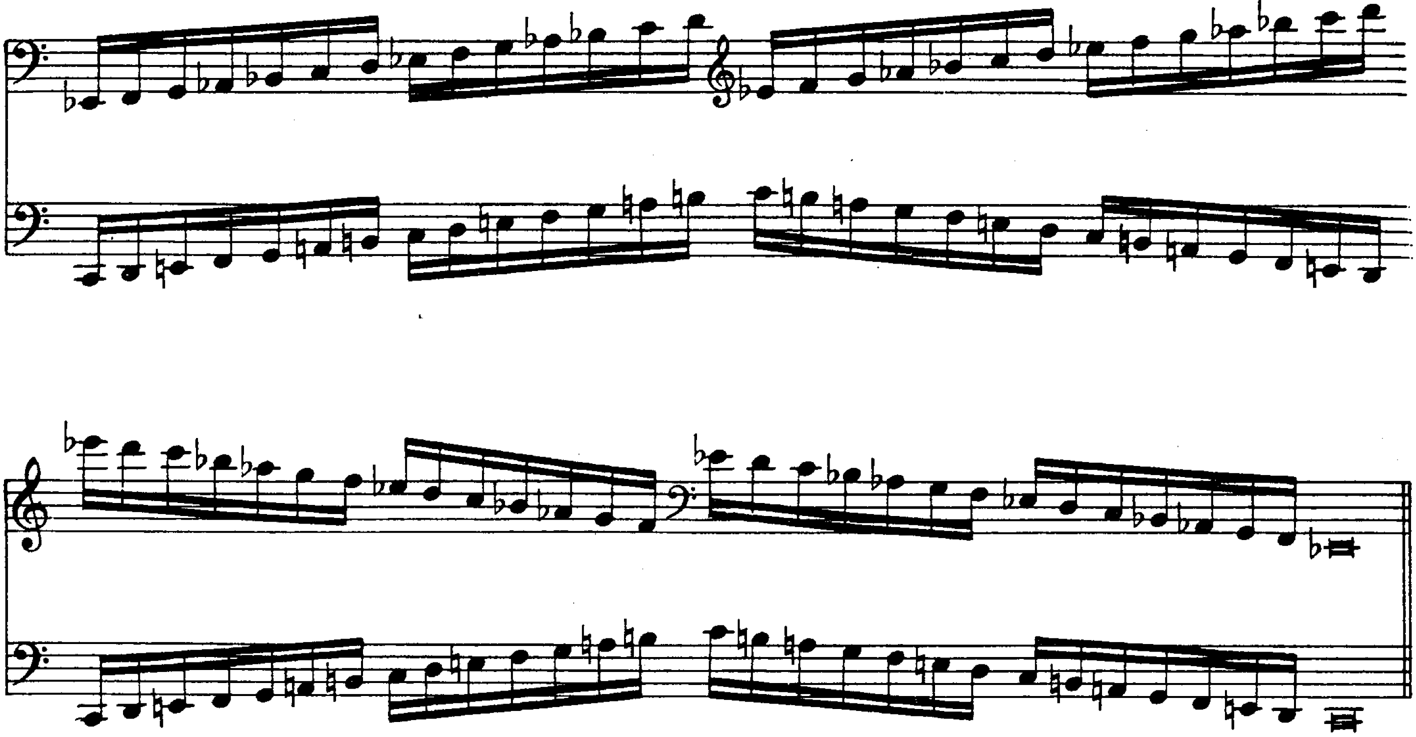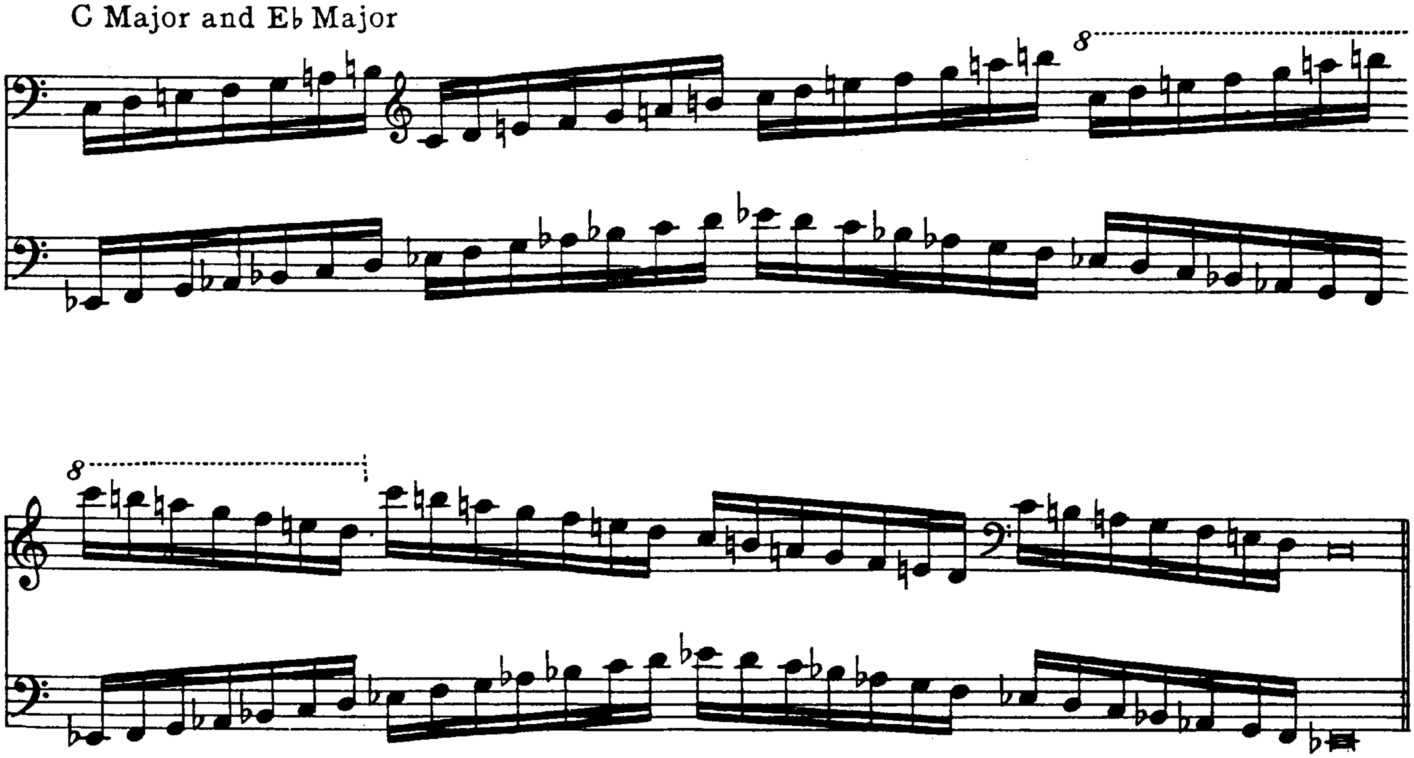






Major
Minor
Augmented
Diminished-Seventh

# Polytonal Scales
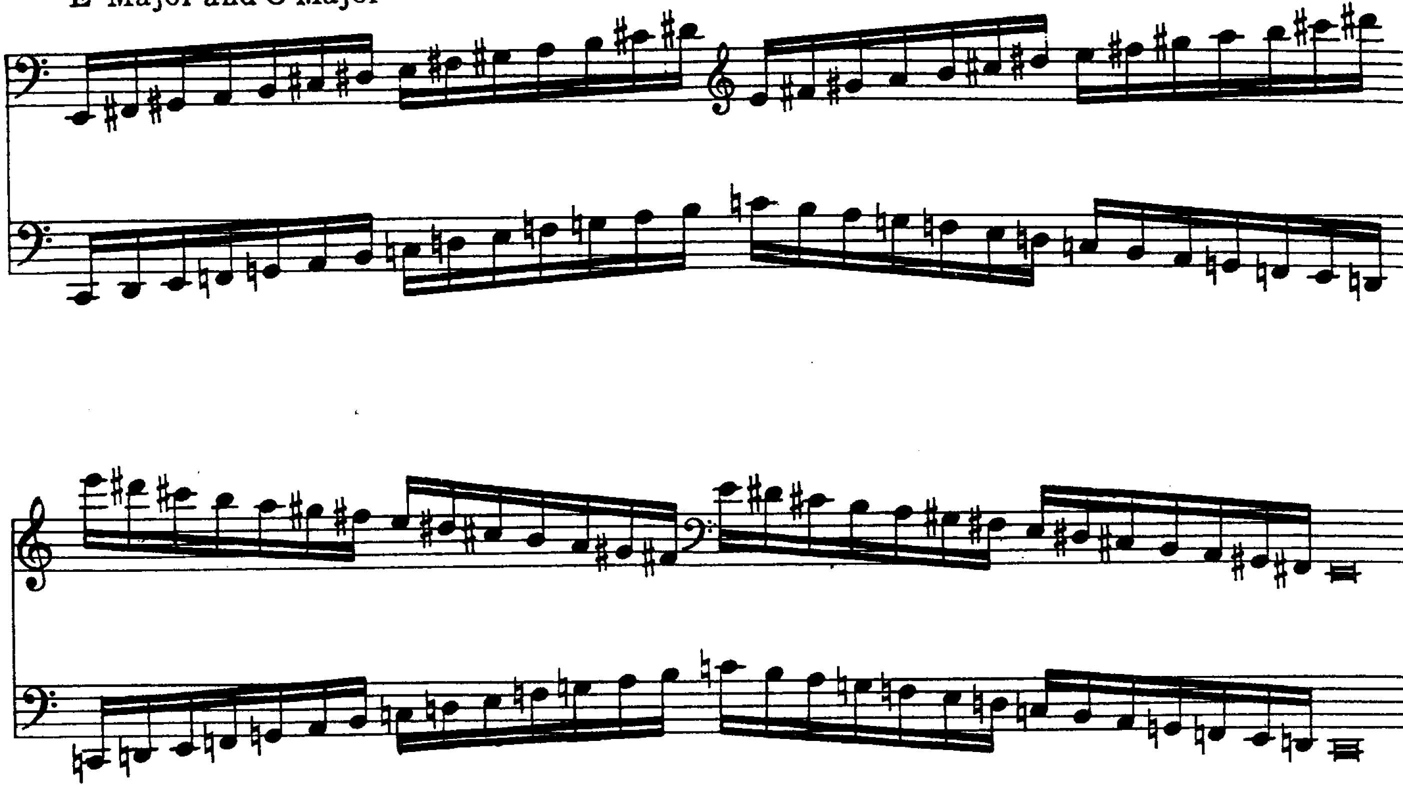
E♭ Major and C Major



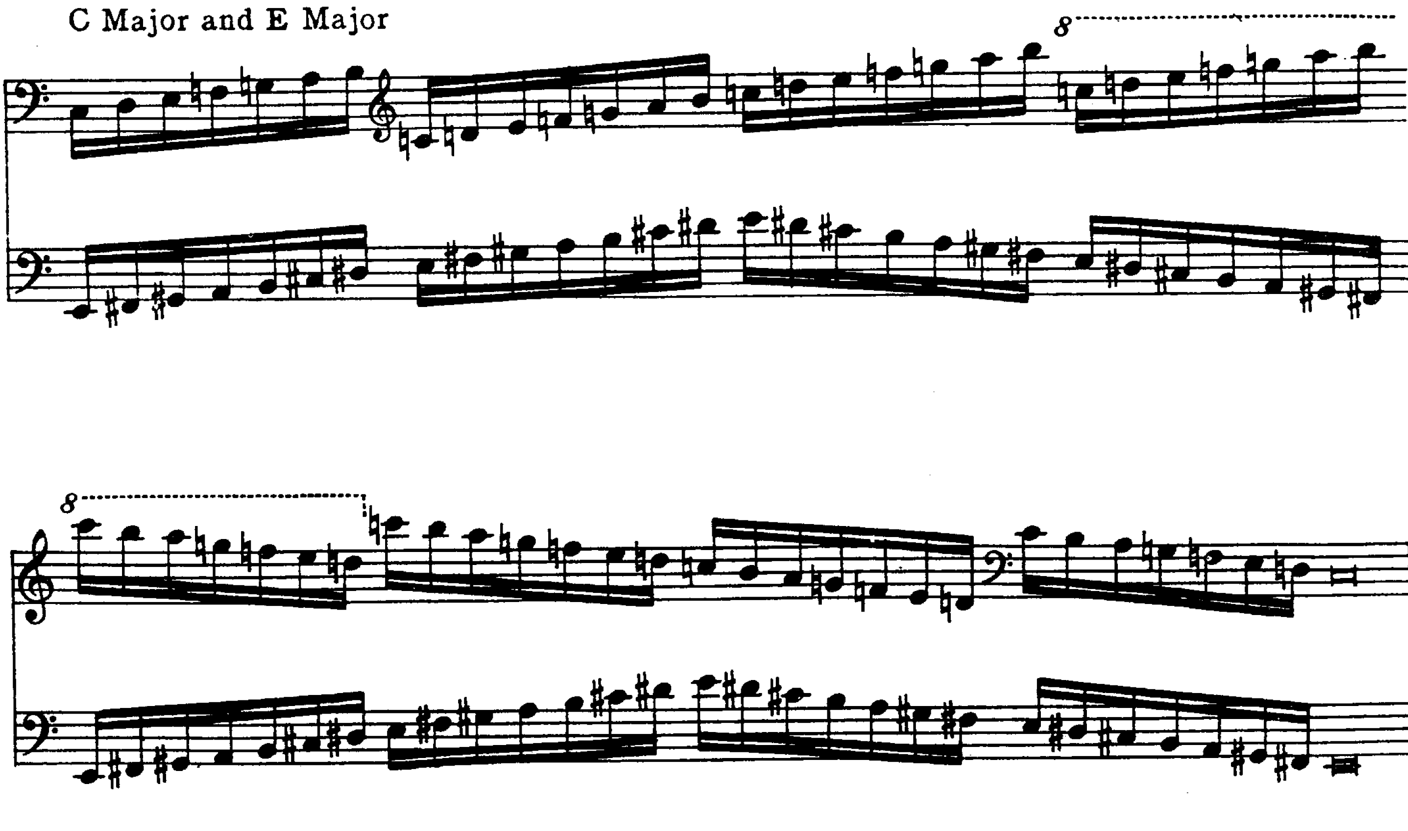
C Major and E♭ Major
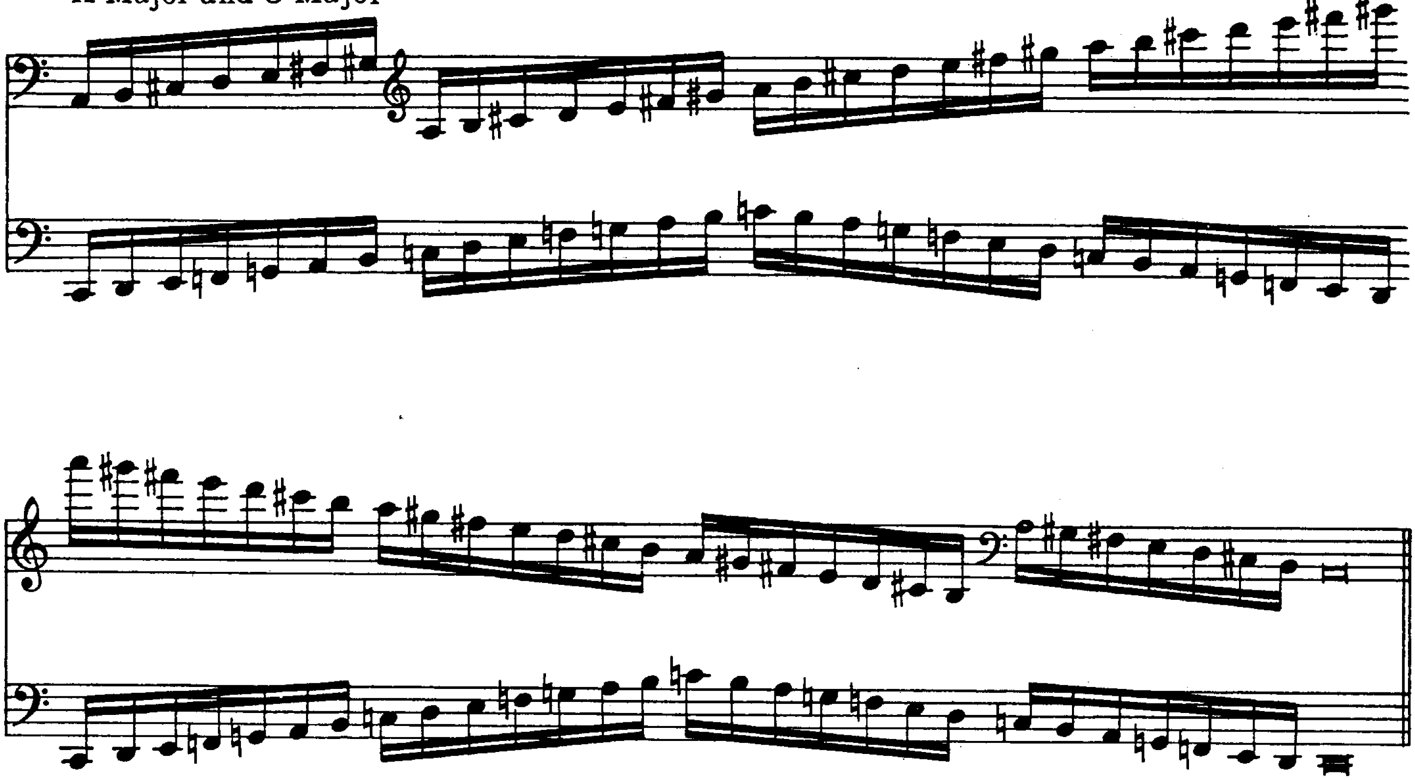


E Major and C Major
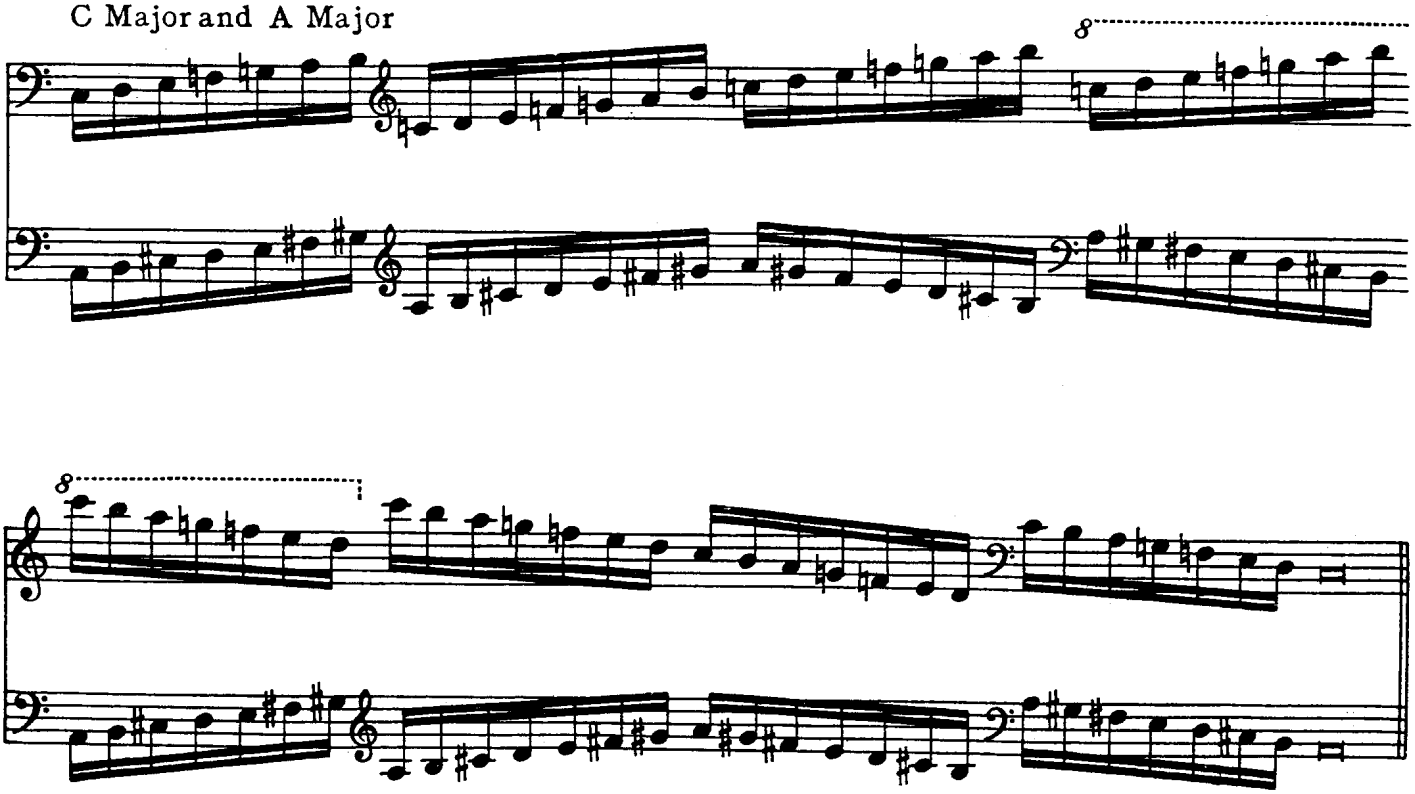


C Major and E Major
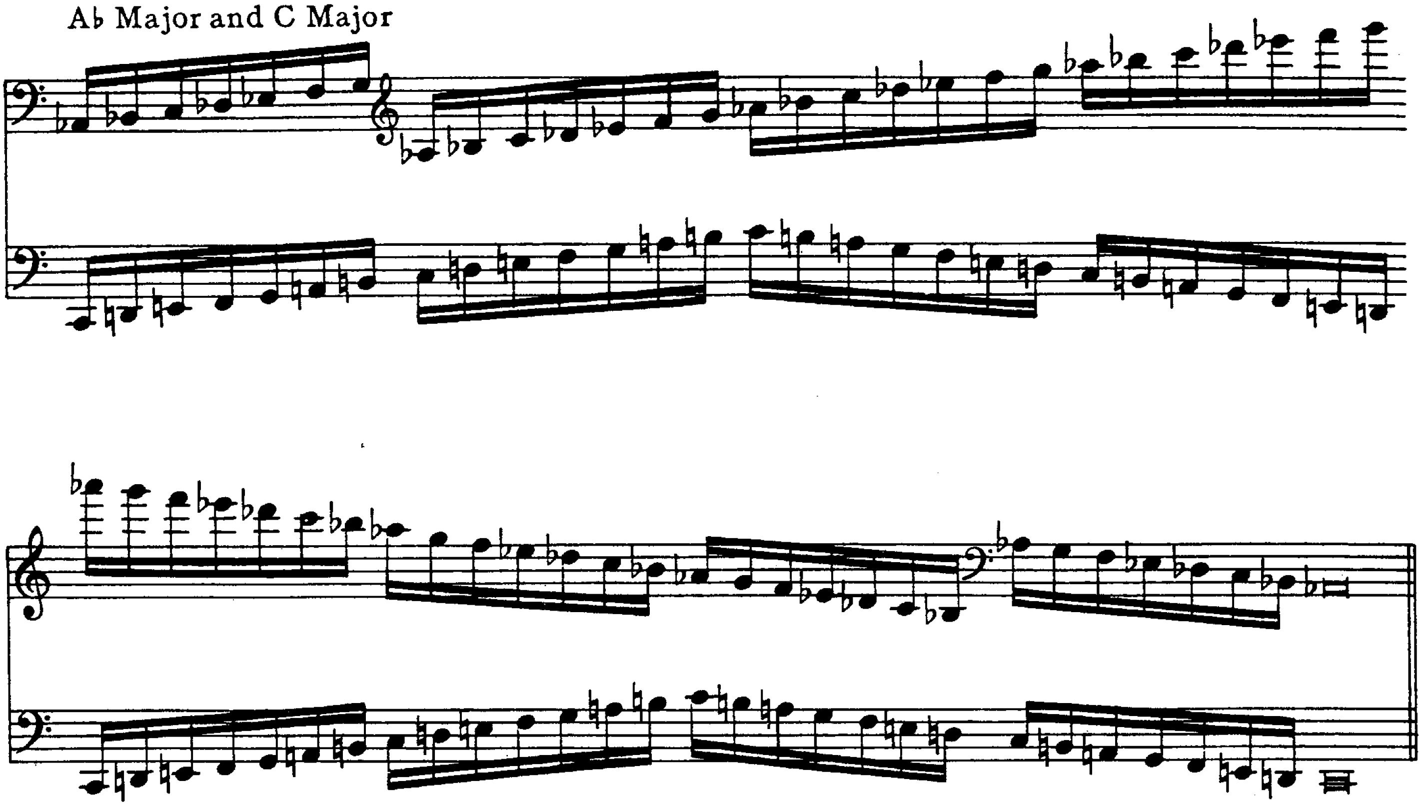


A Major and C Major
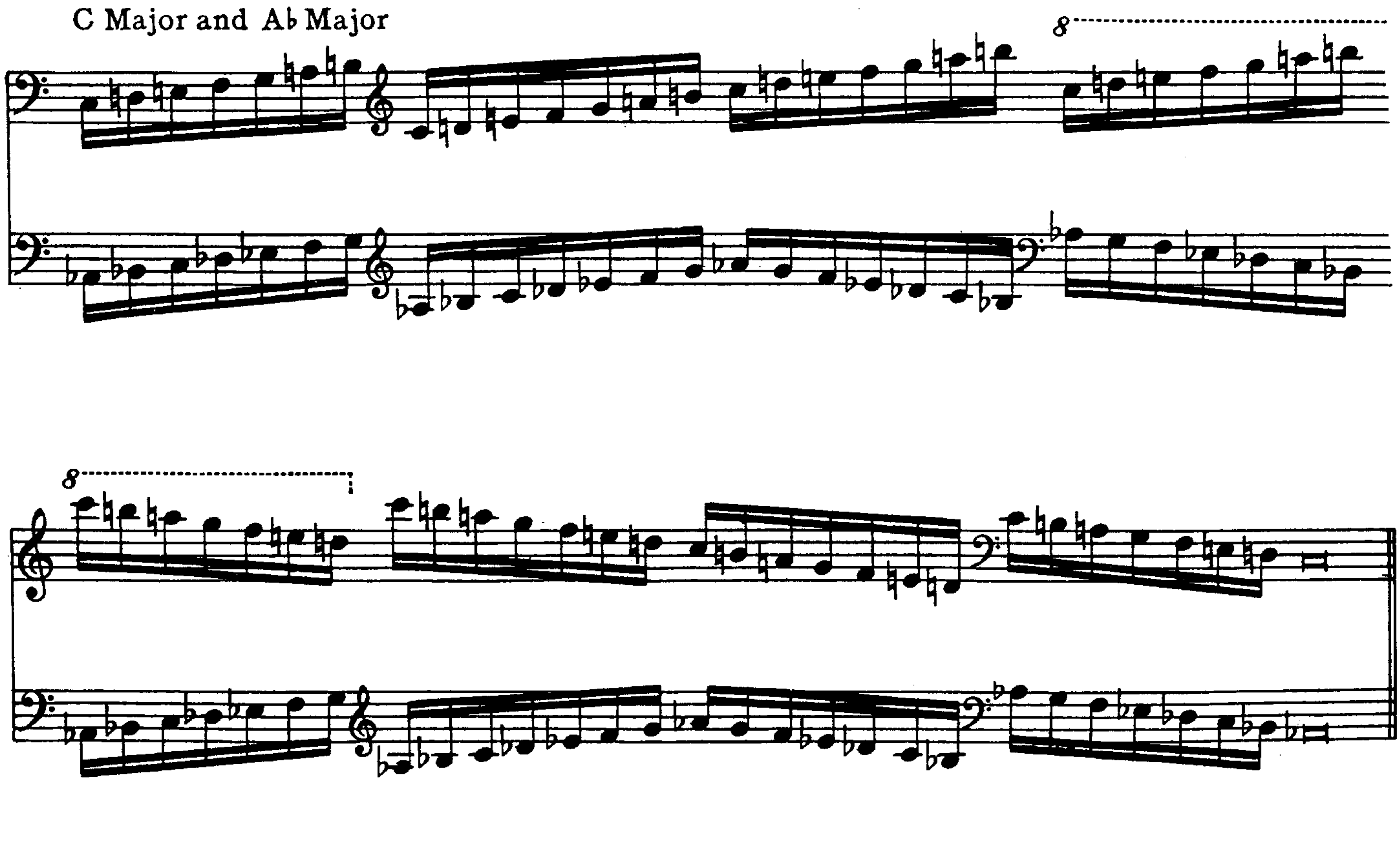


C Major and A Major



A♭ Major and C Major
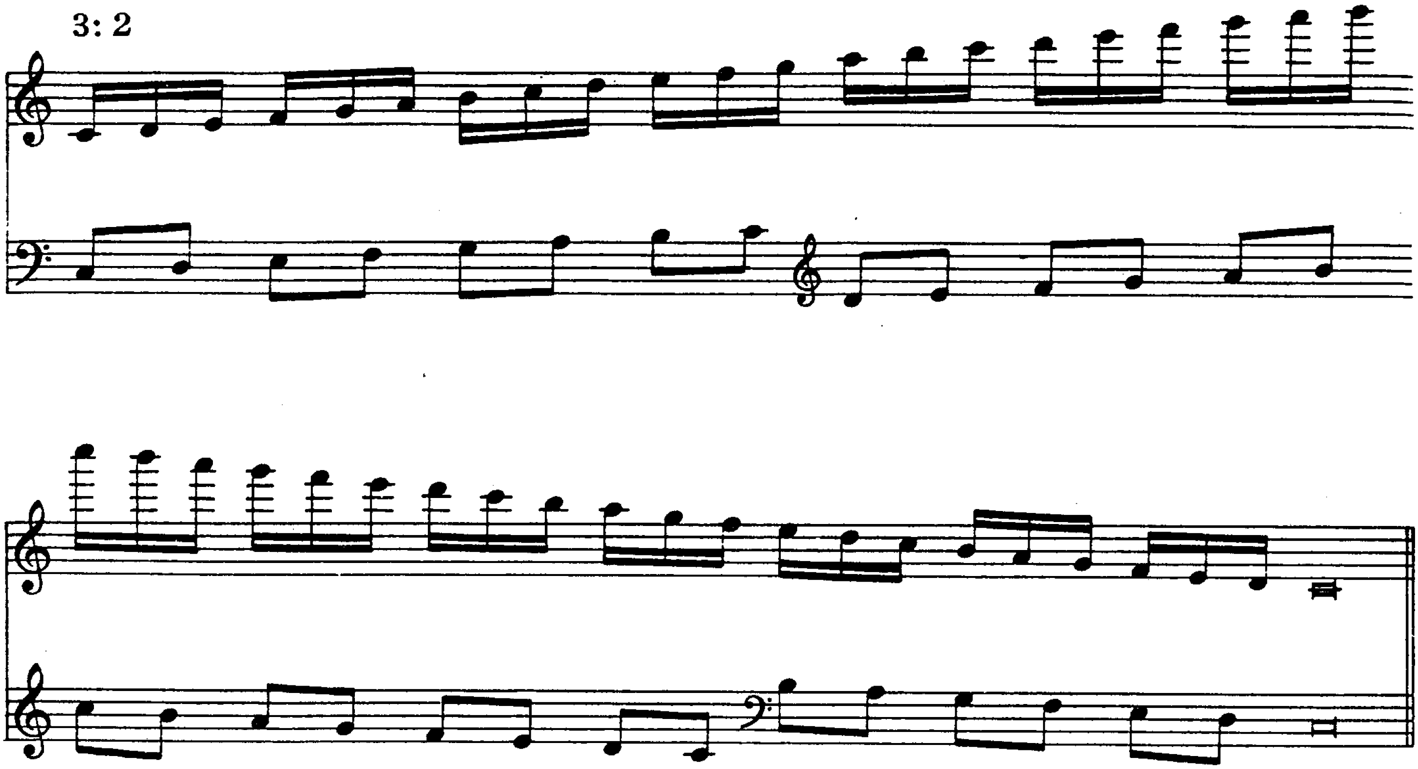


C Major and A♭ Major
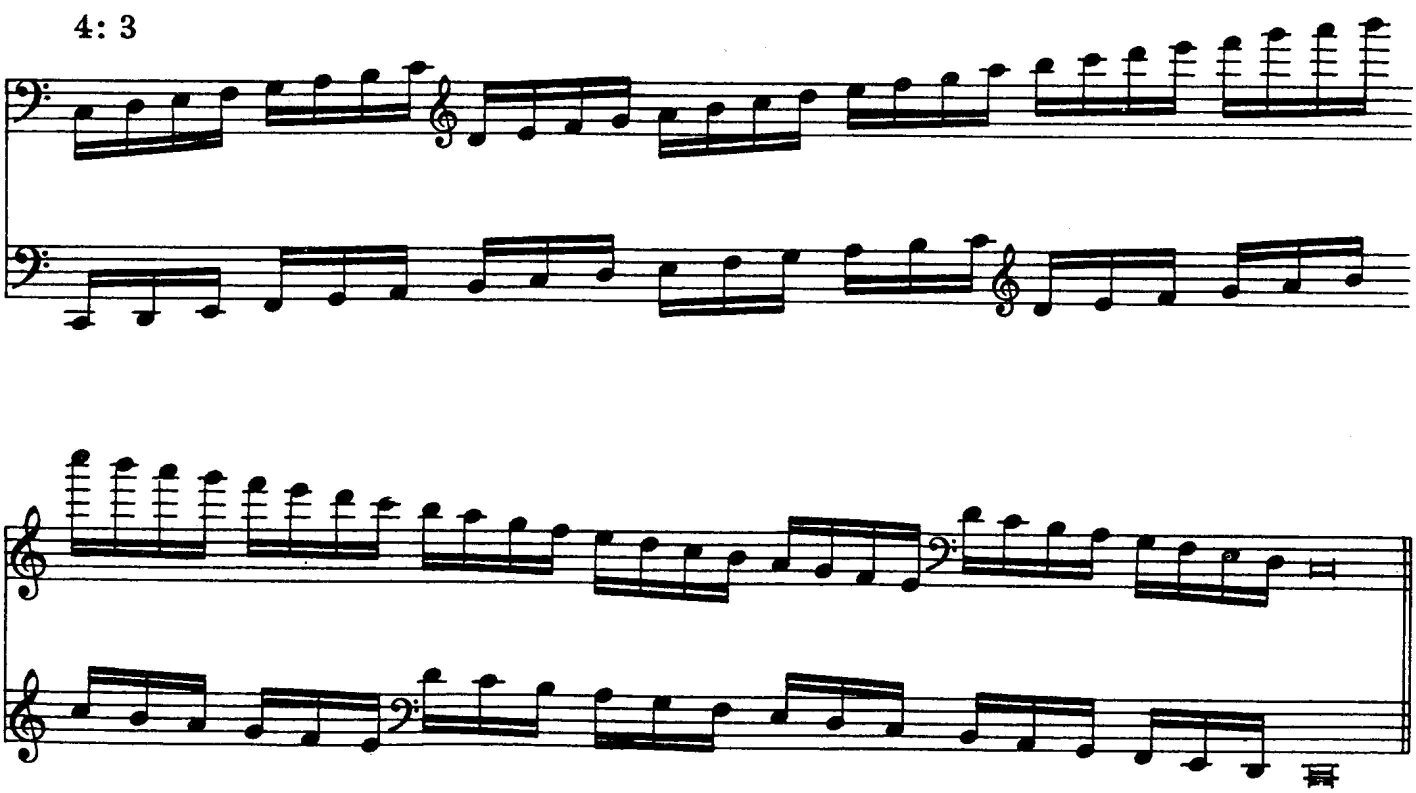


# Polyrhythmic Scales
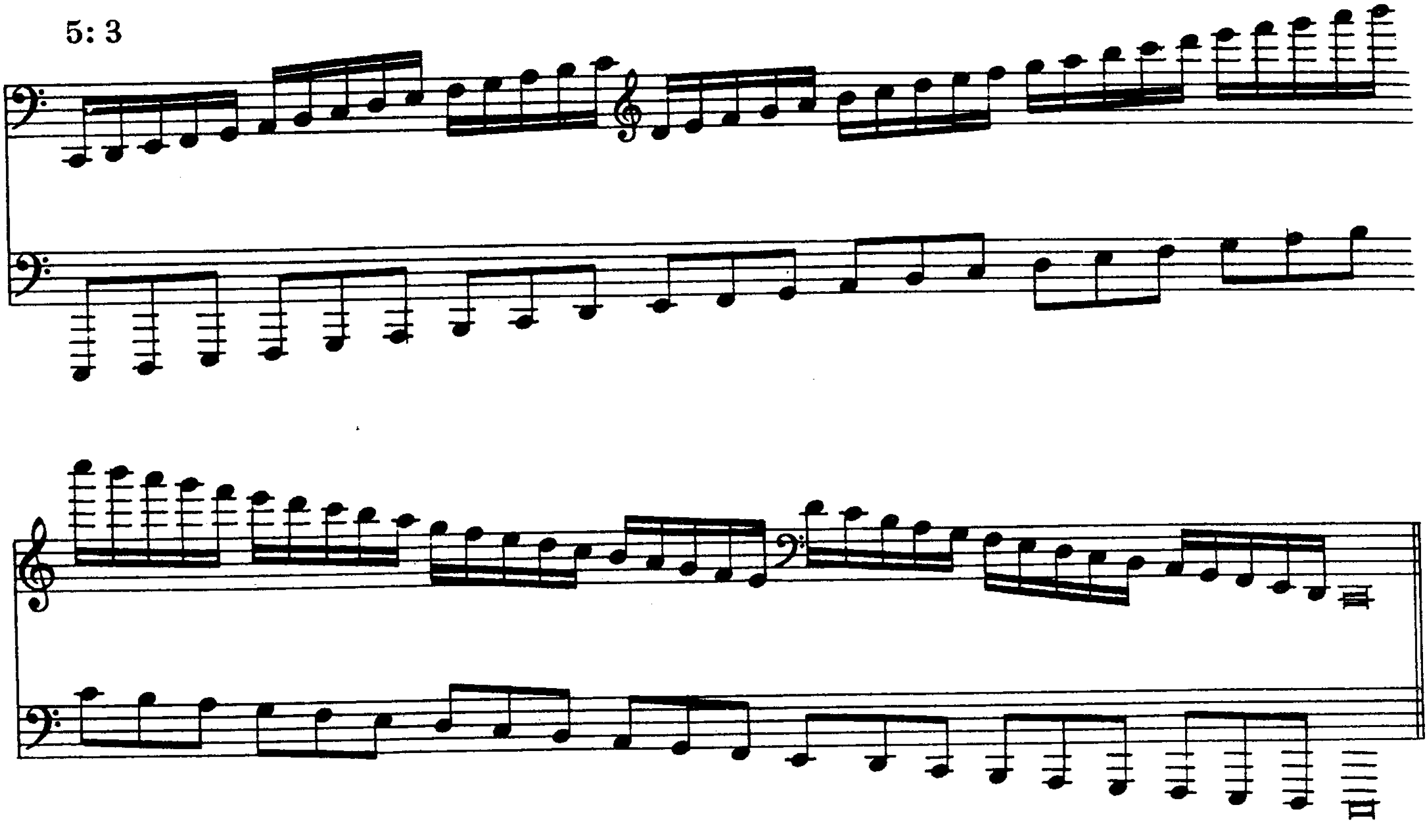
3: 2
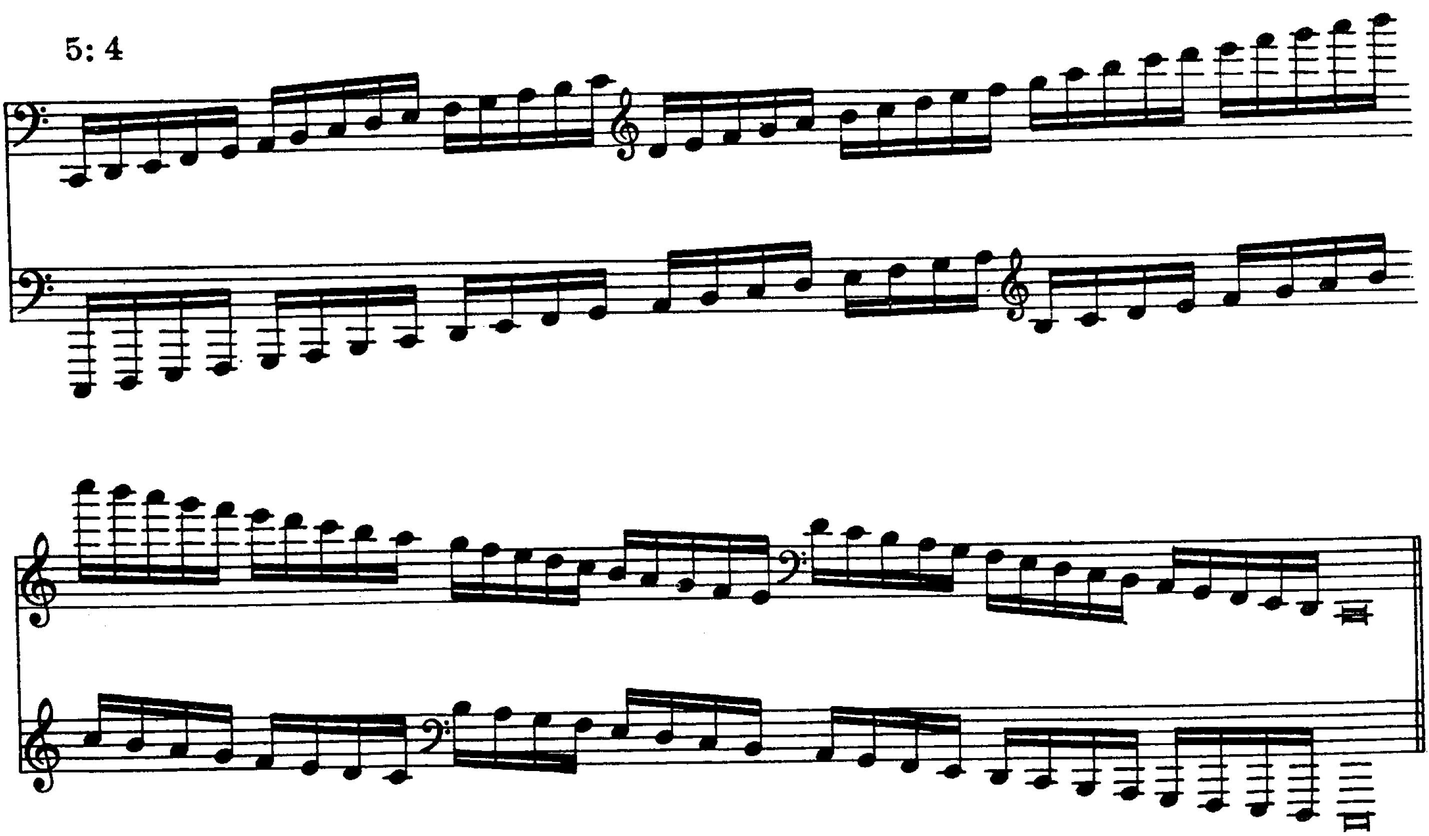


4: 3



5: 3
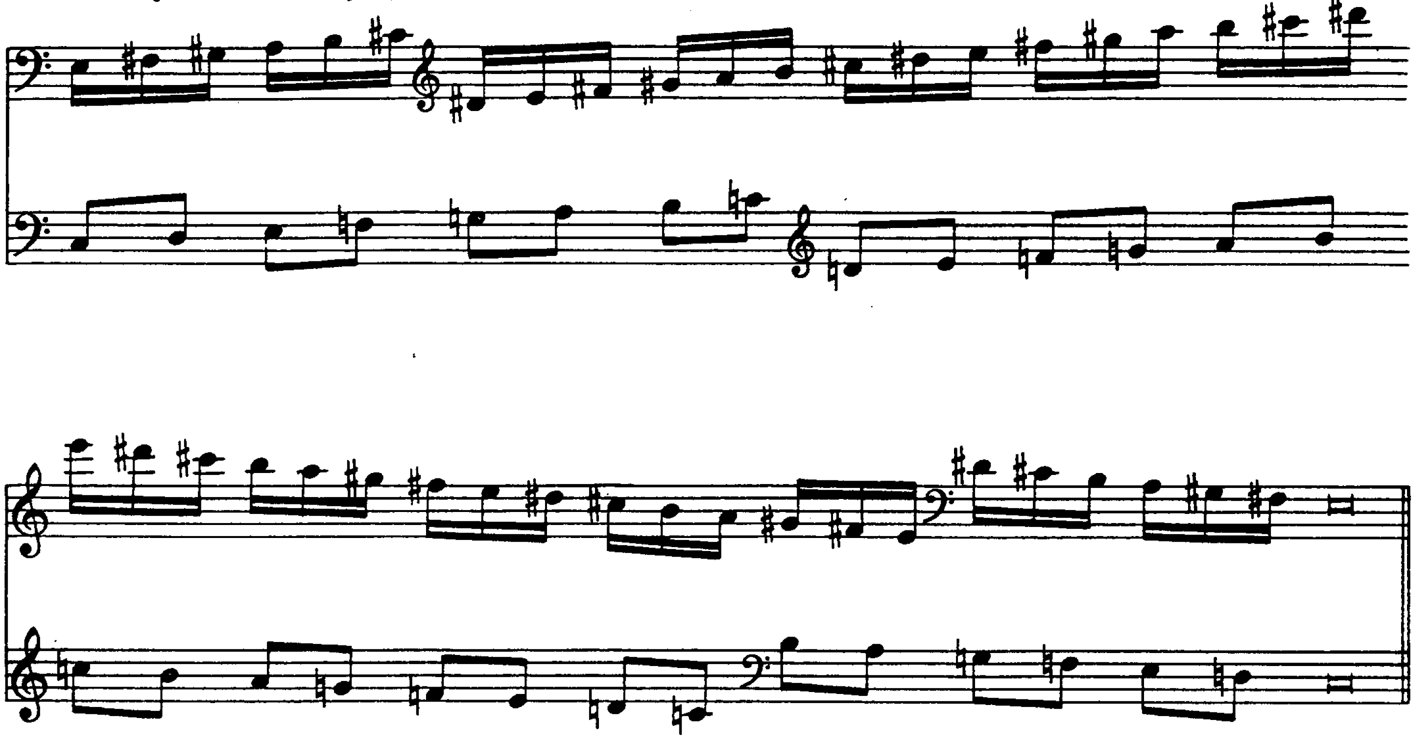


5: 4
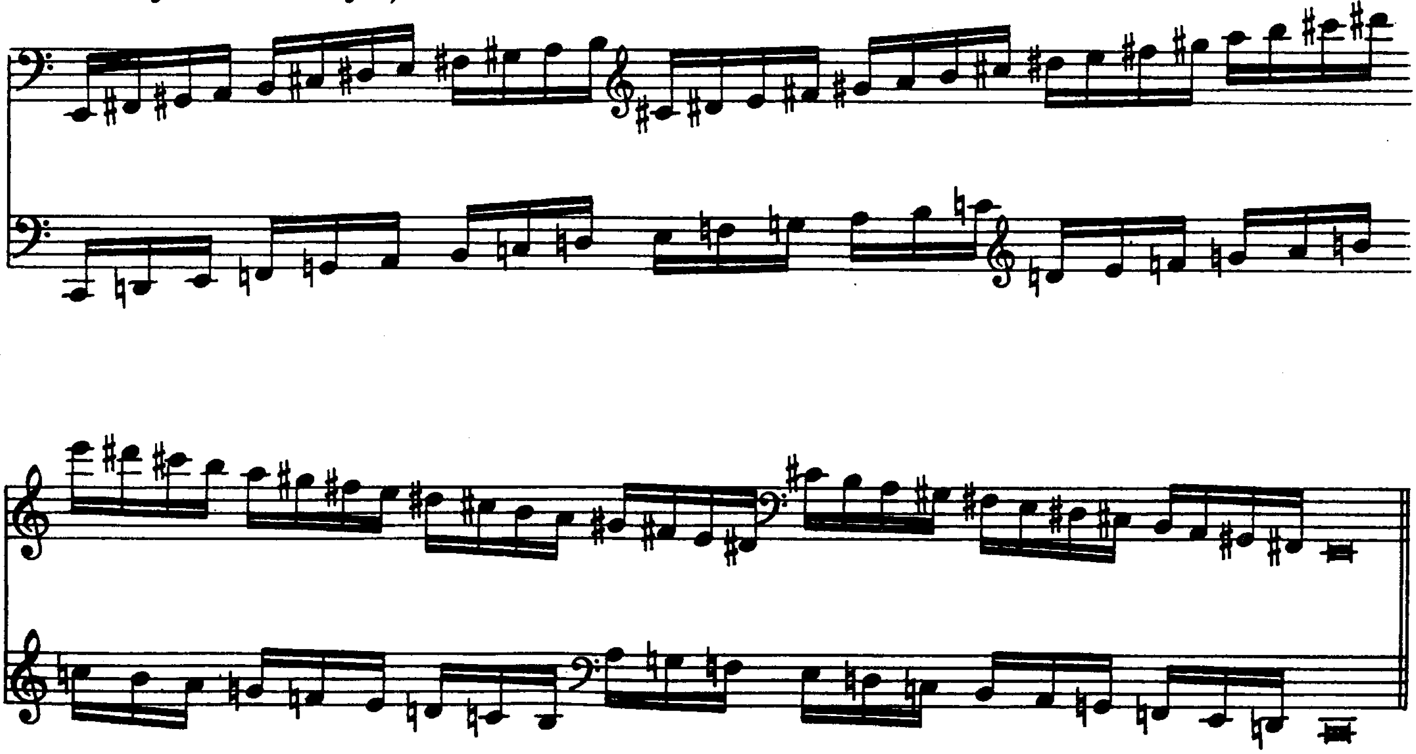


# Polytonal Polyrhythmic Scales
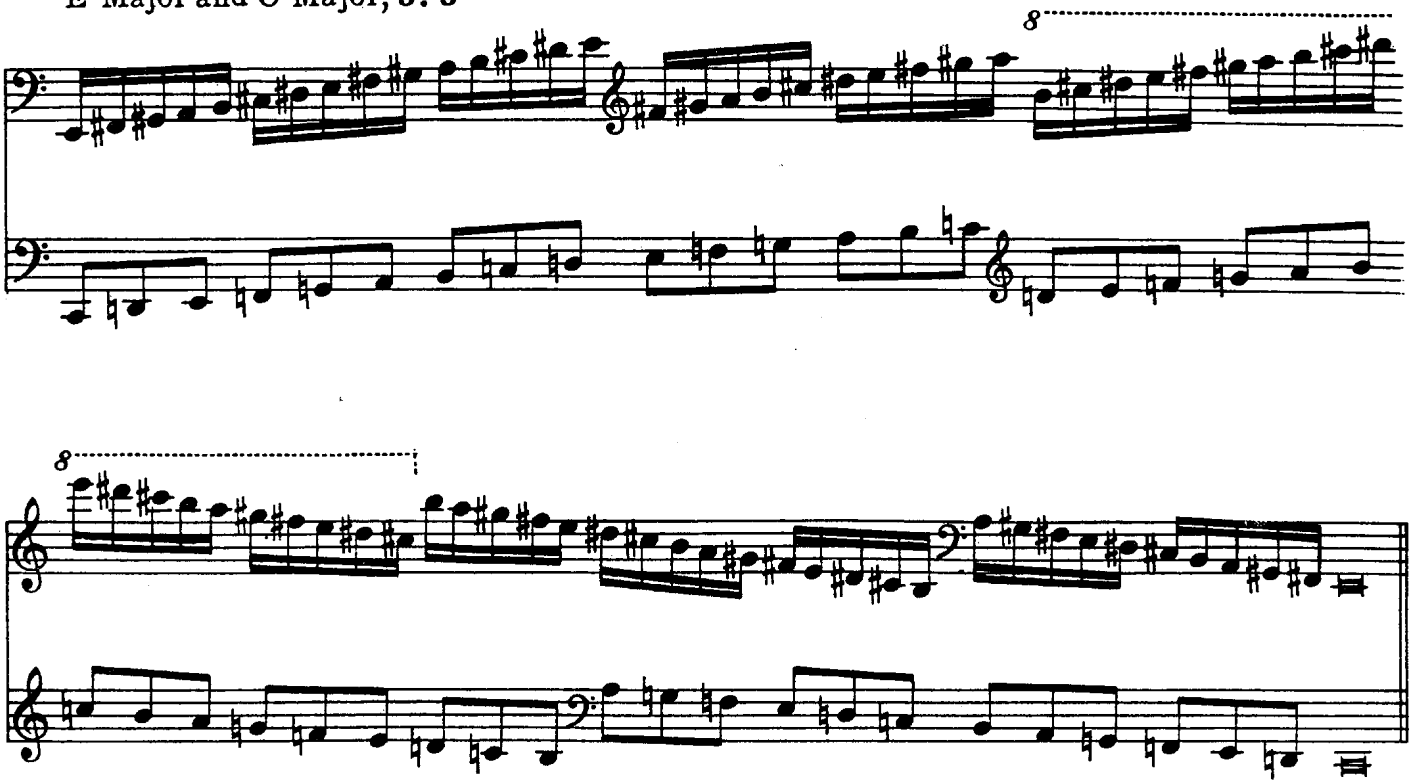
E Major and C Major; 3: 2
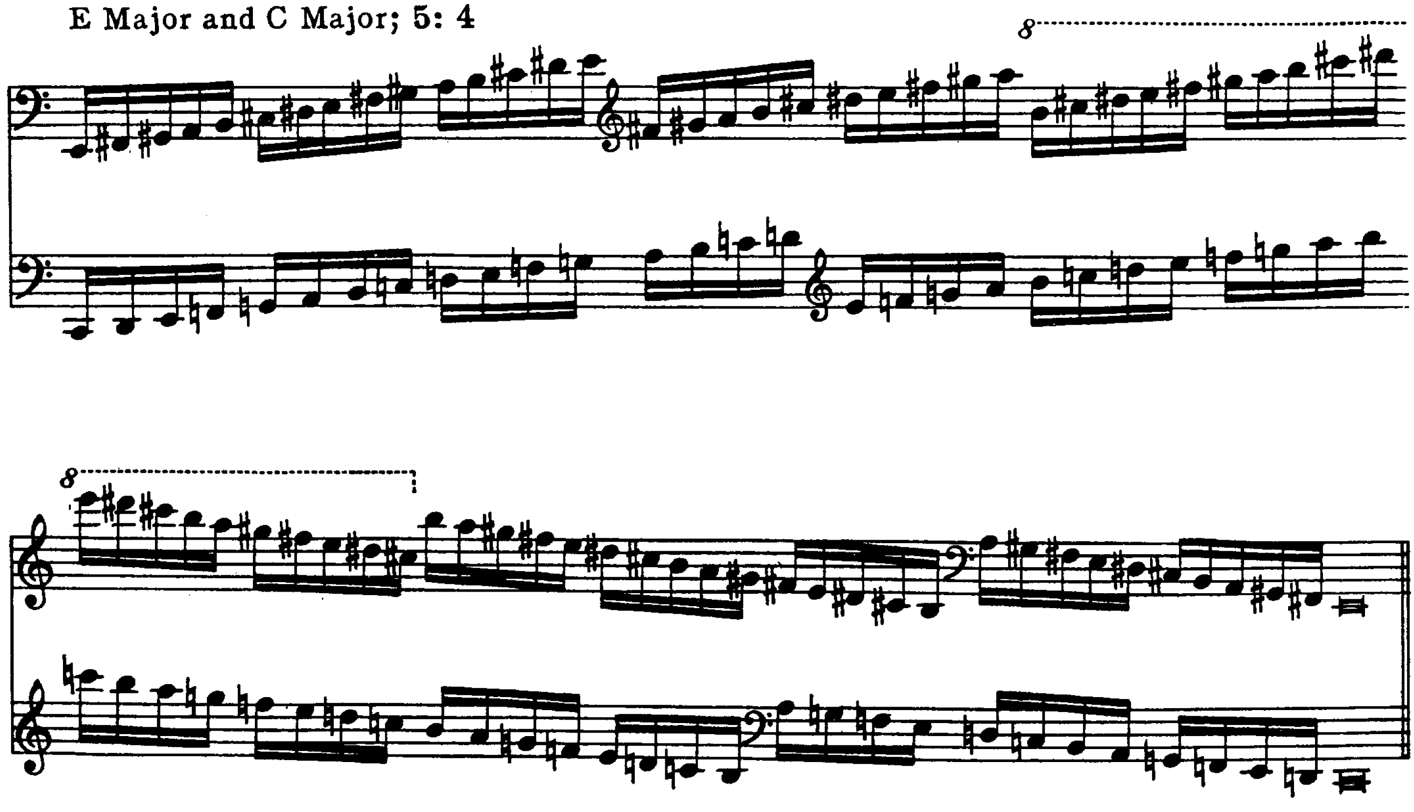


E Major and C Major; 4: 3
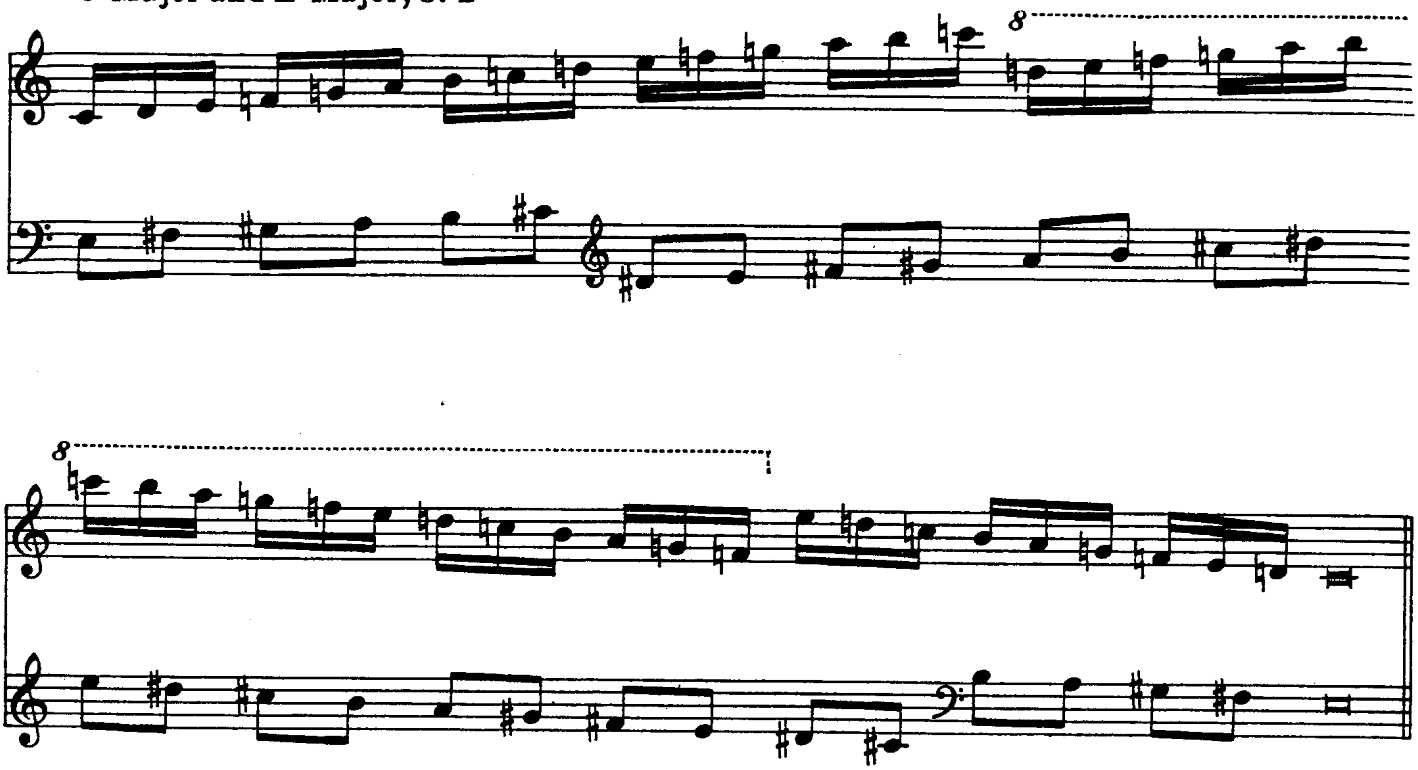


E Major and C Major; 5: 3
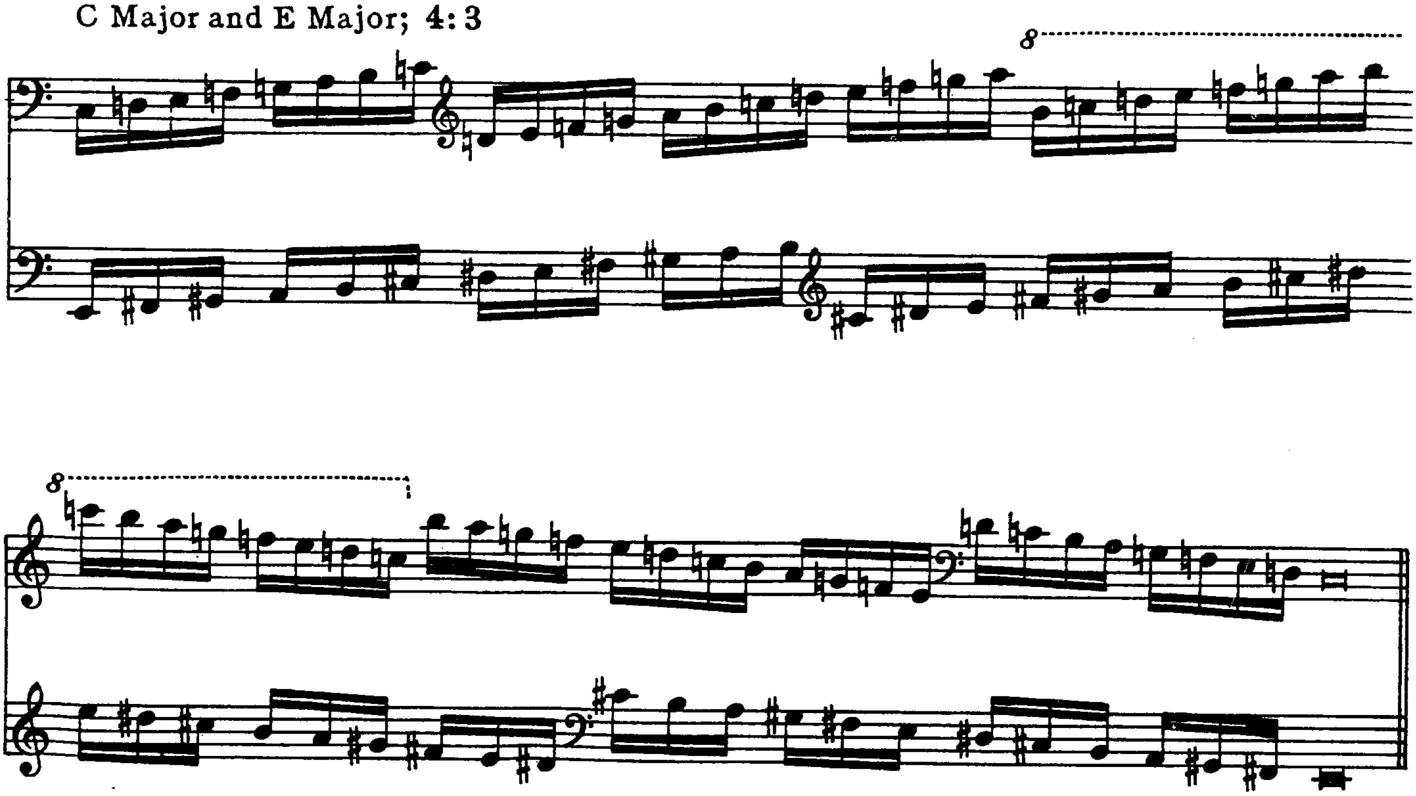


E Major and C Major; 5: 4
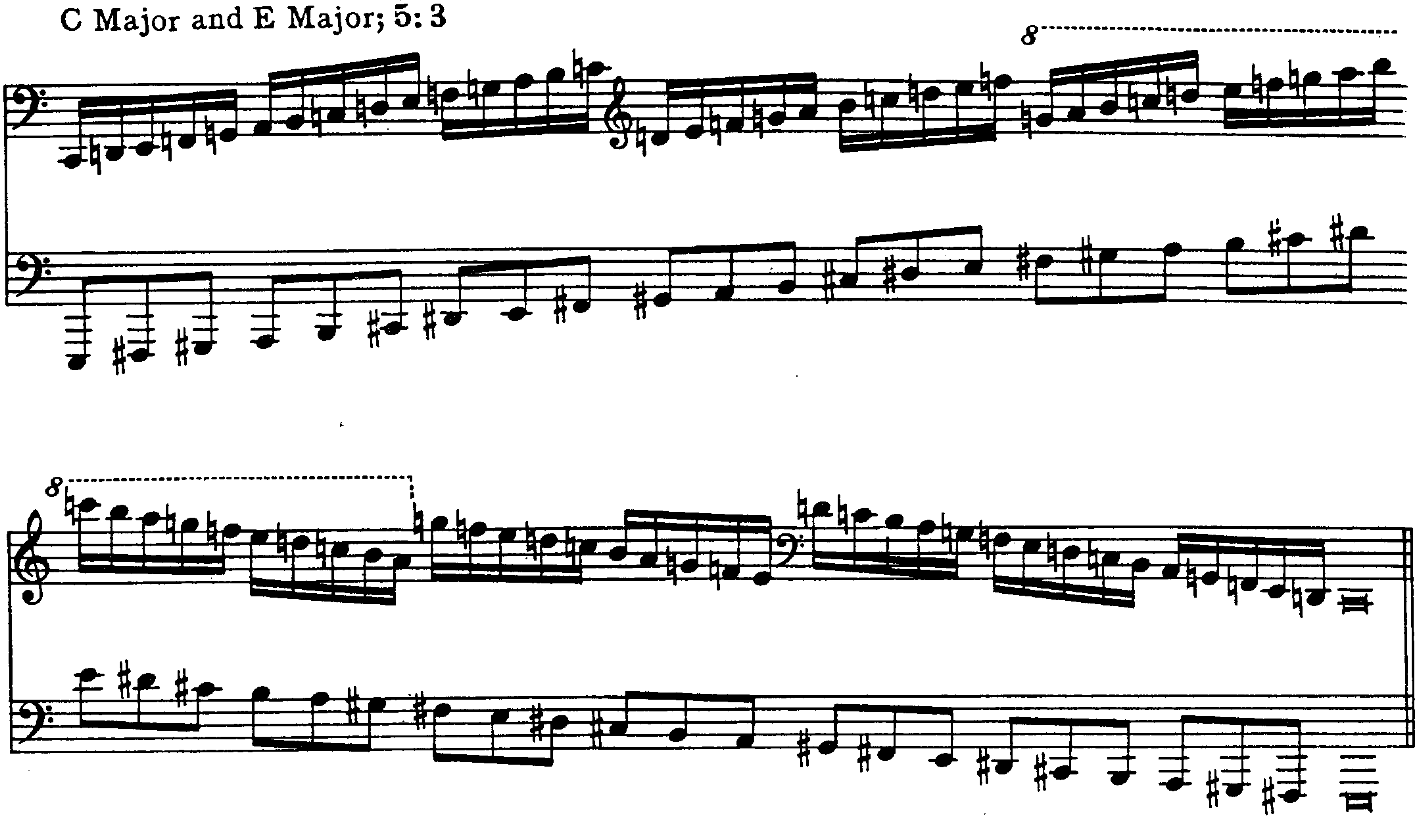


C Major and E Major; 3: 2
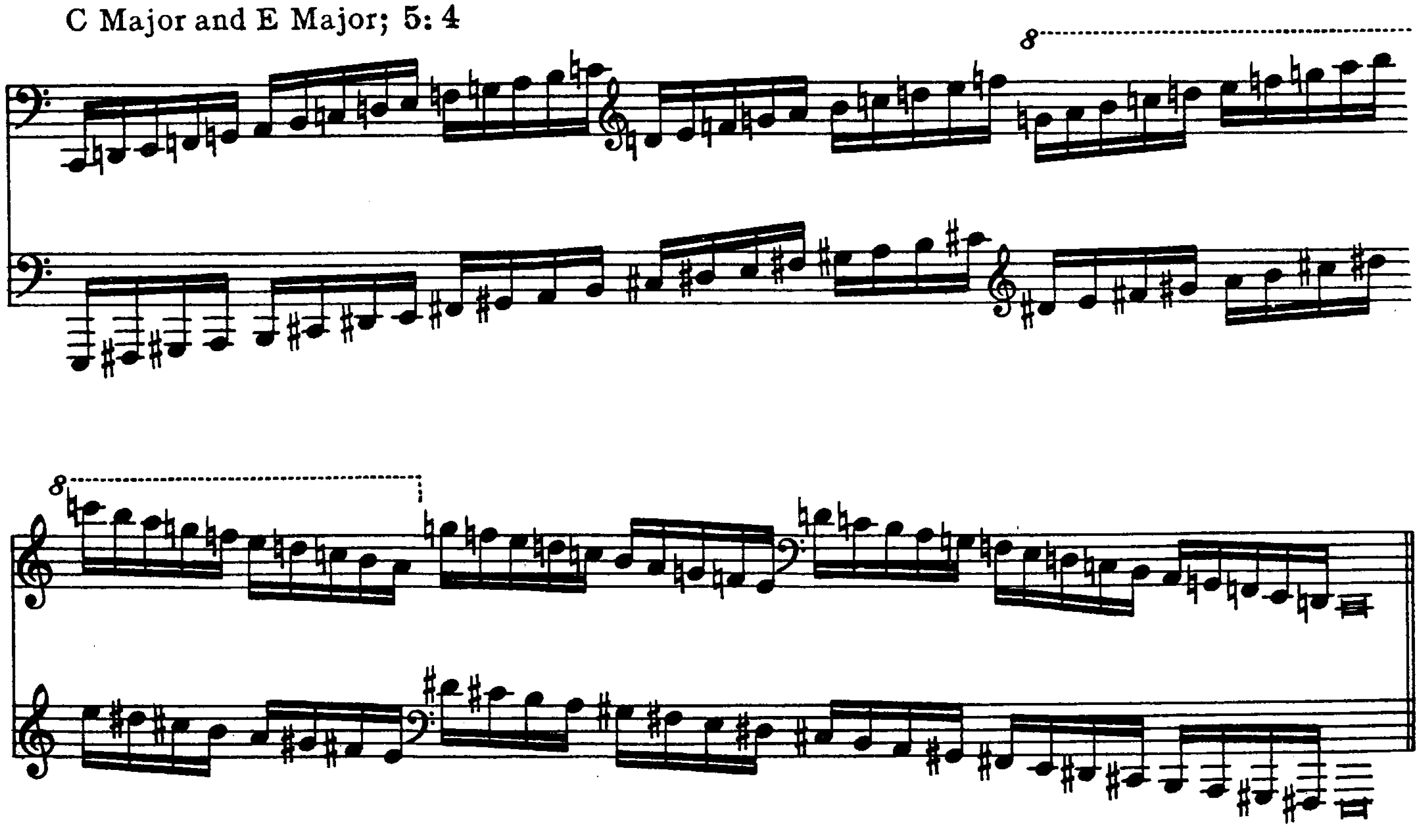


C Major and E Major; 4: 3
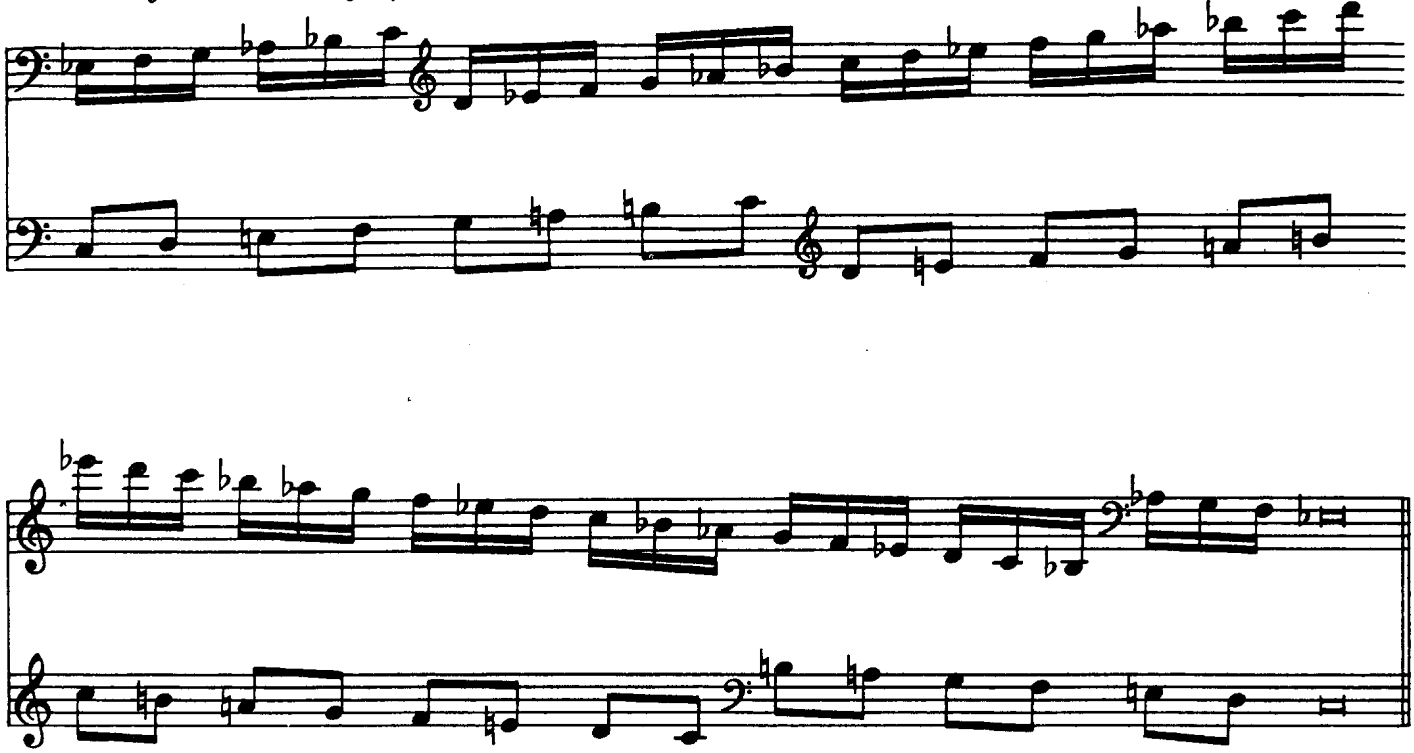


C Major and E Major; 5: 3
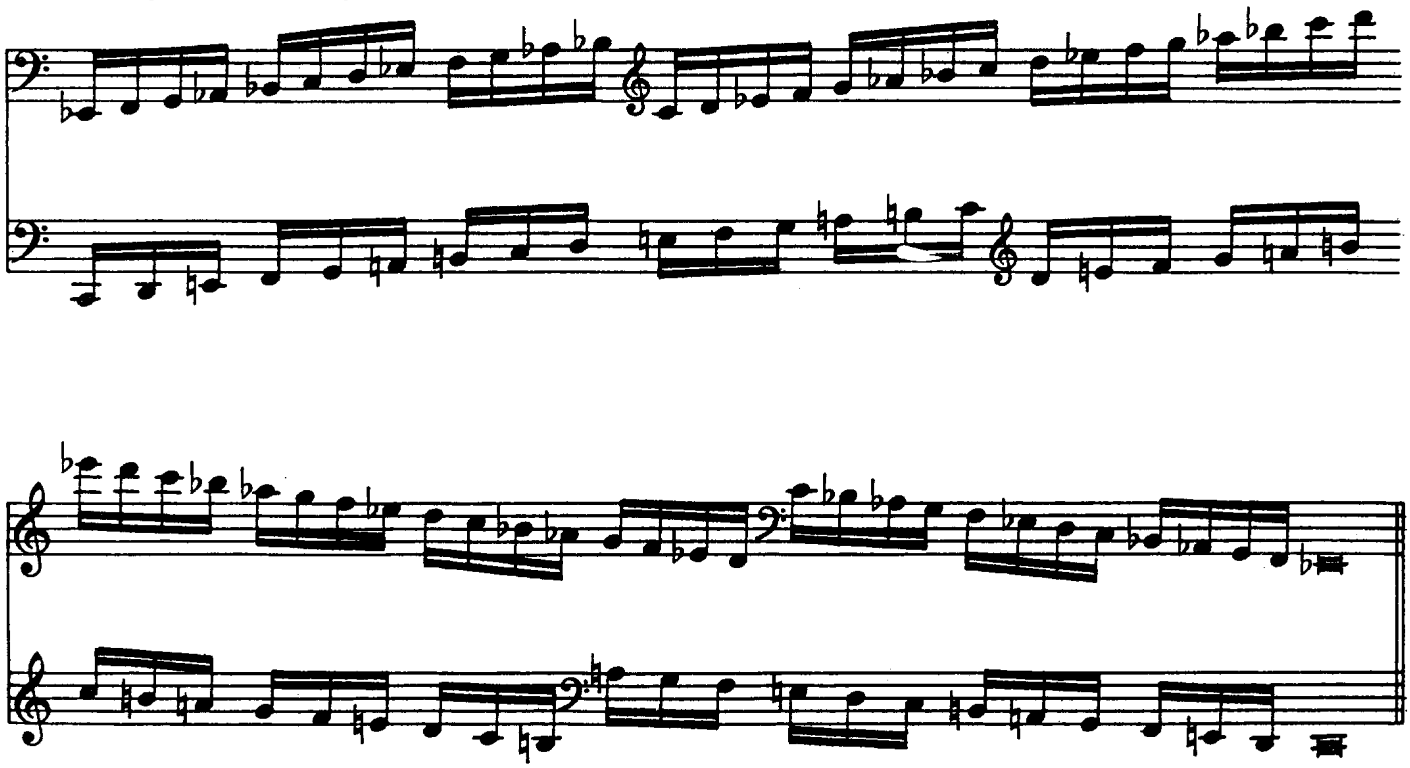


C Major and E Major; 5: 4
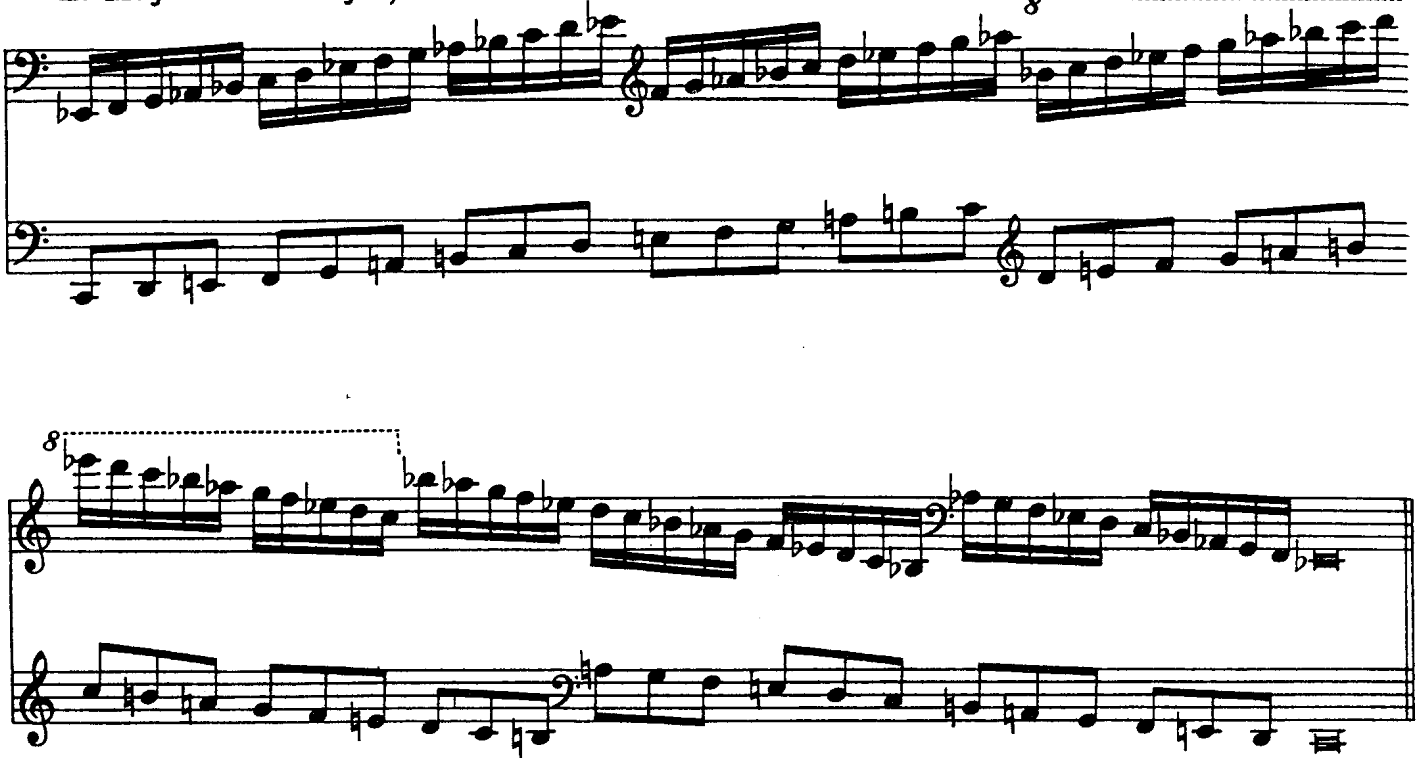


Eb Major and C Major; 3: 2
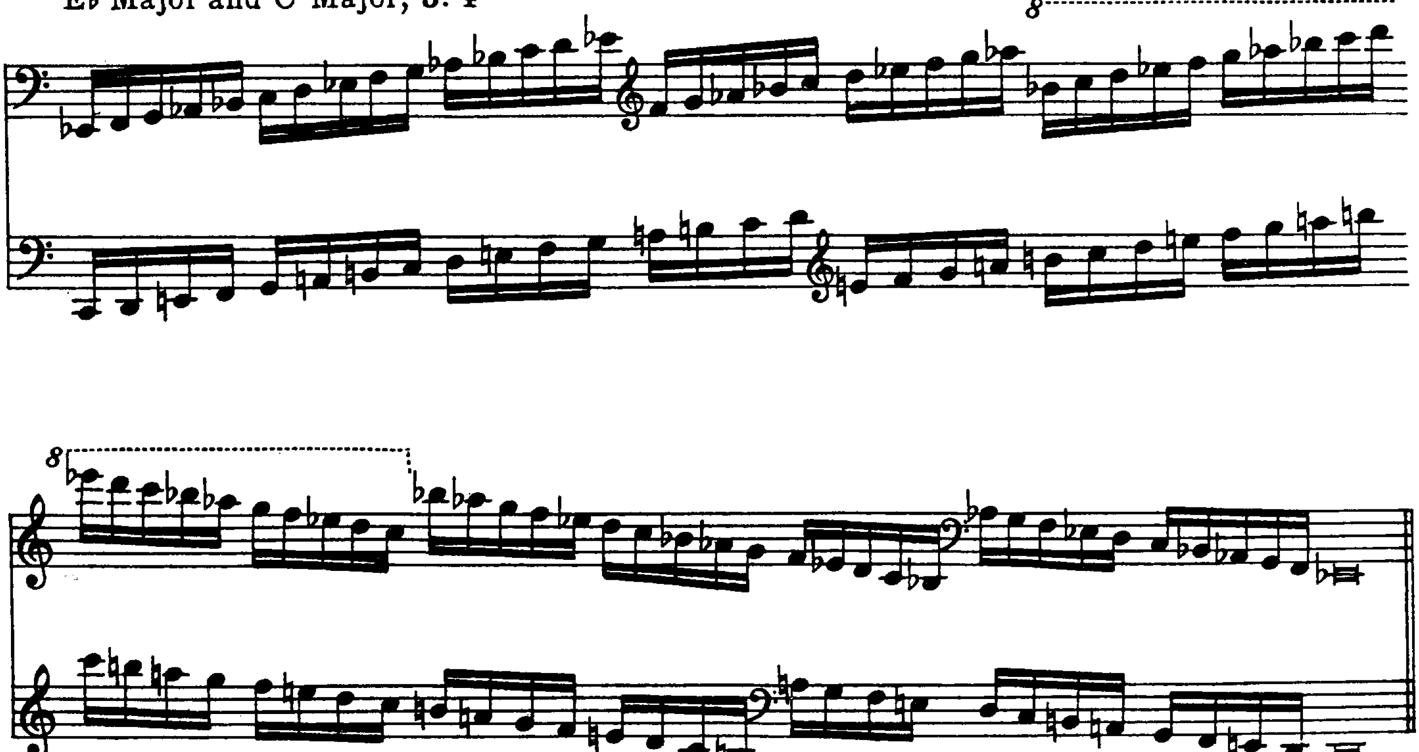


Eb Major and C Major; 4: 3
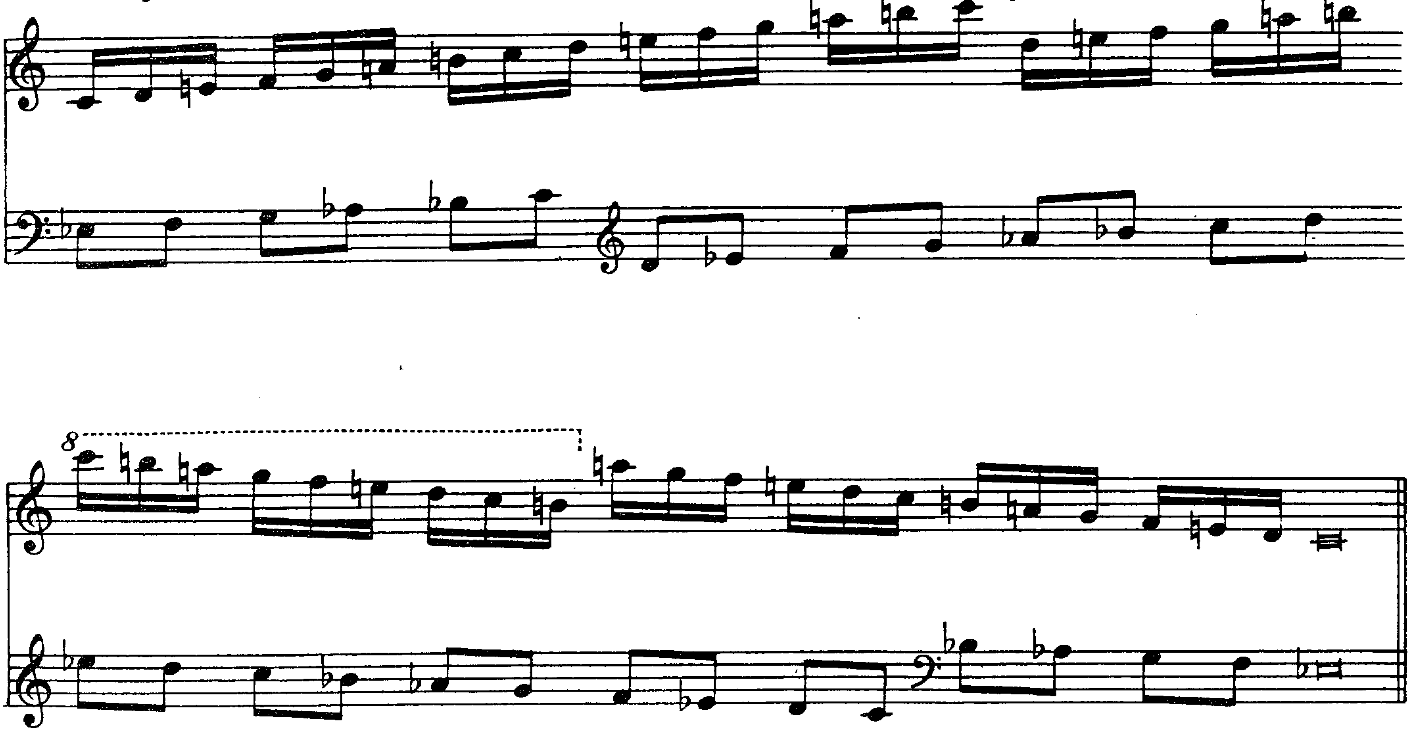


E♭ Major and C Major; 5: 3
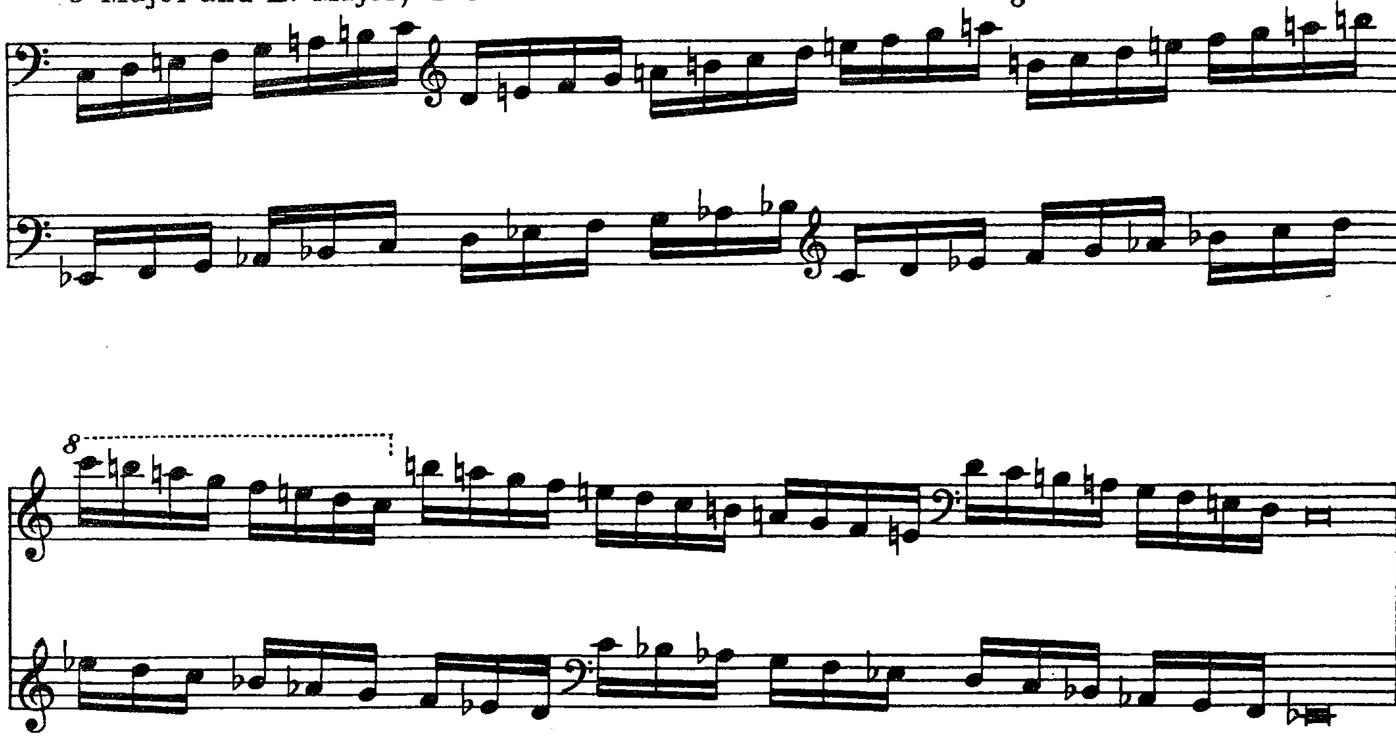


E♭ Major and C Major; 5: 4
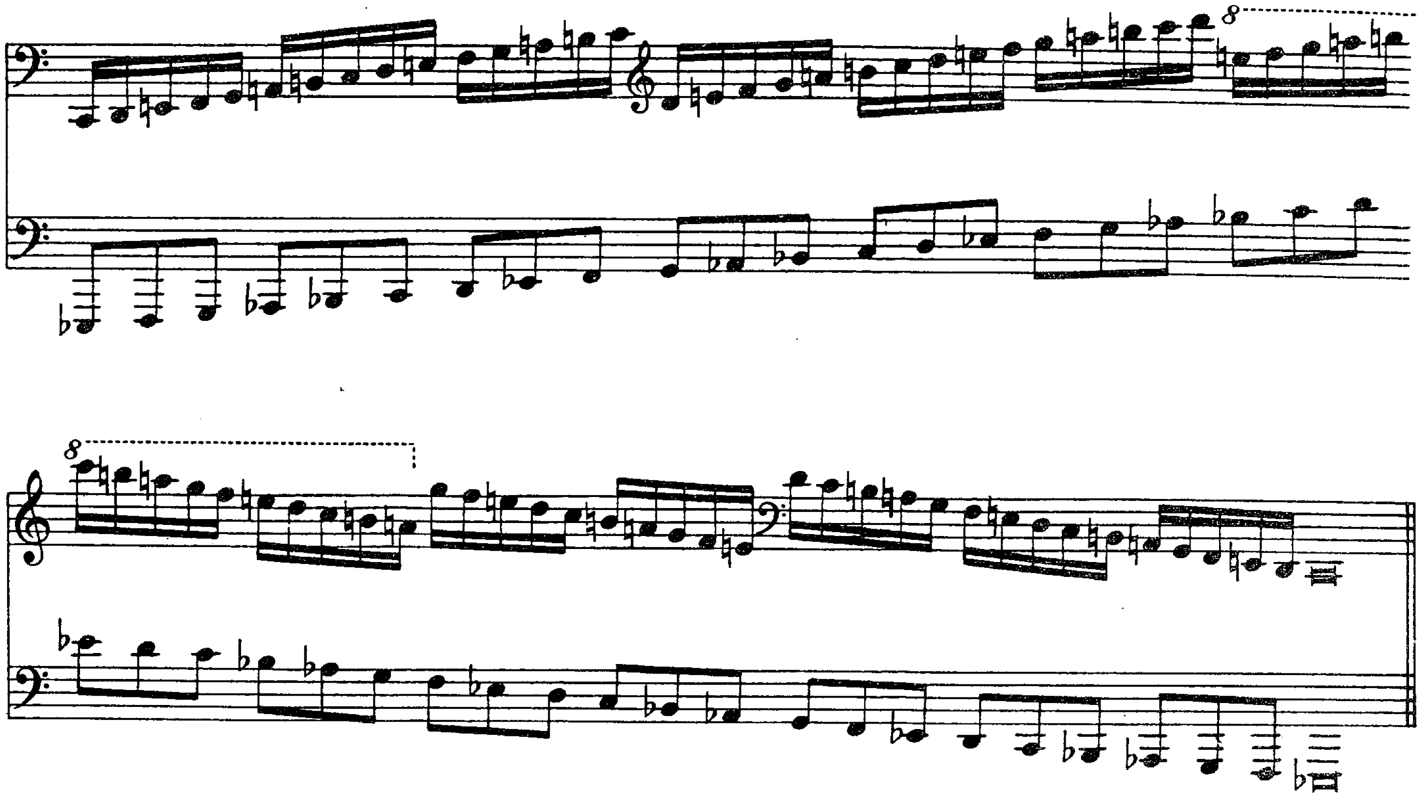


C Major and E♭ Major; 3: 2
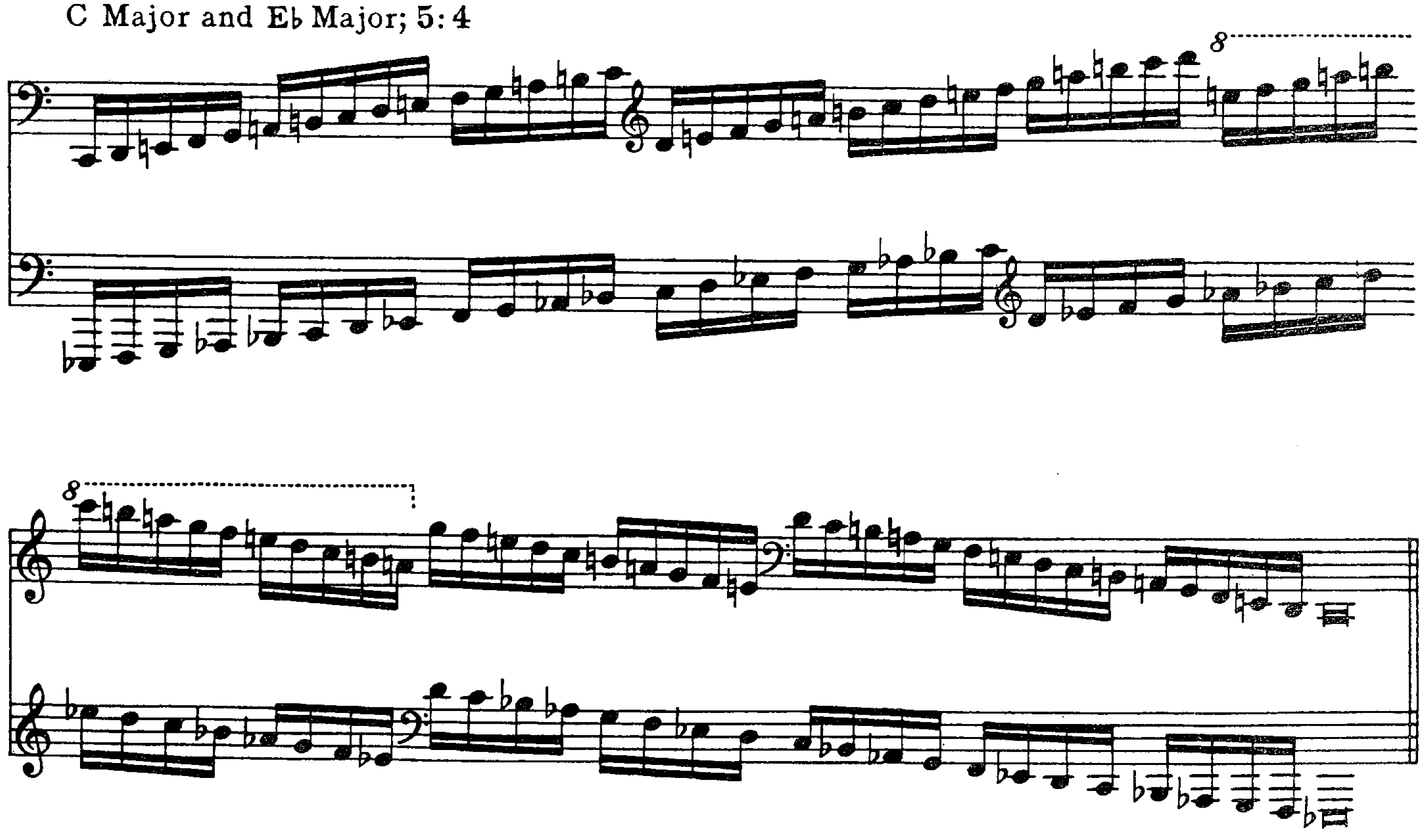


C Major and E♭ Major; 4: 3



C Major and E♭ Major; 5:3
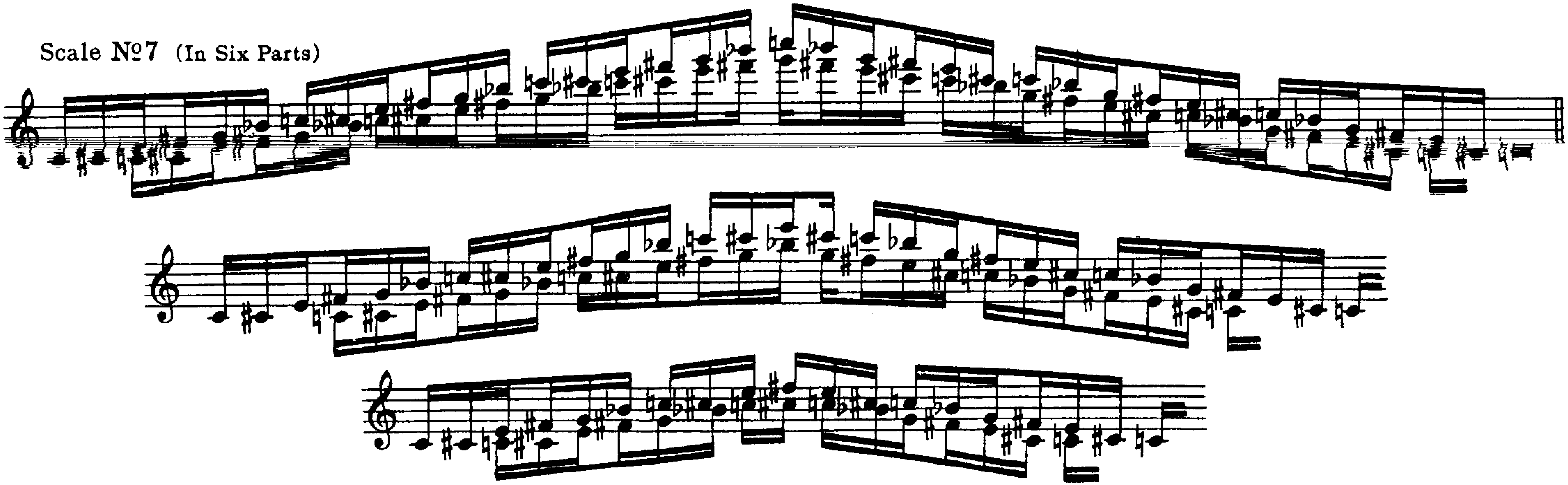


C Major and E♭ Major; 5:4



# Palindromic Canons
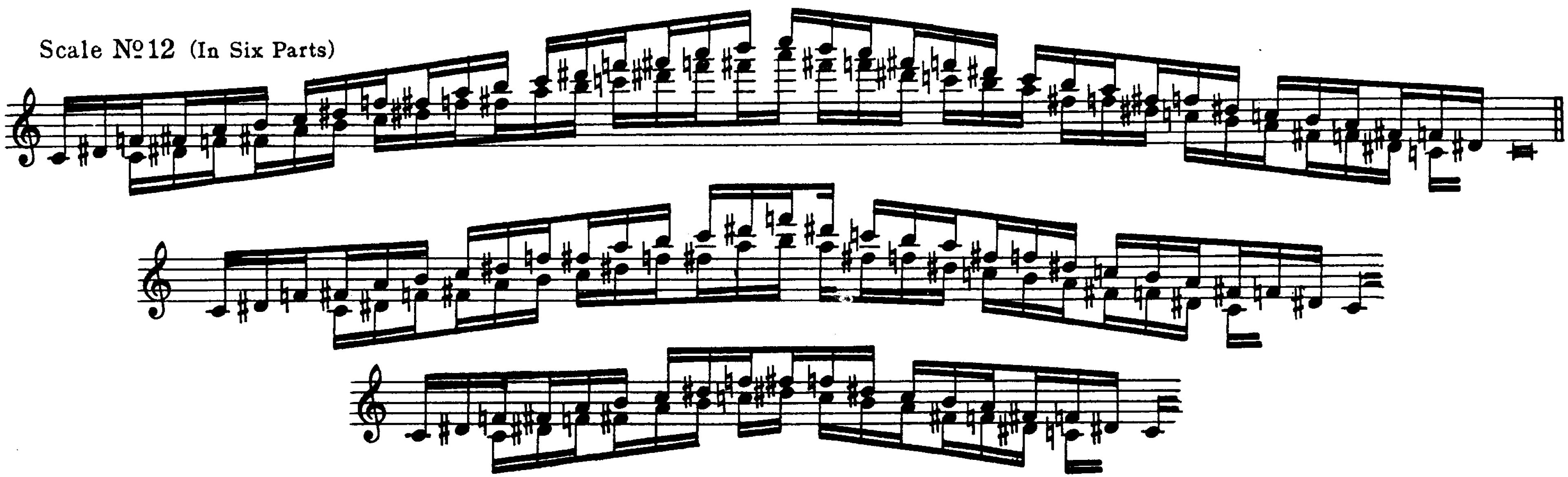
## Bitonal Palindromic Canon: C Major and F♯ Major

Scale №7 (In Six Parts)
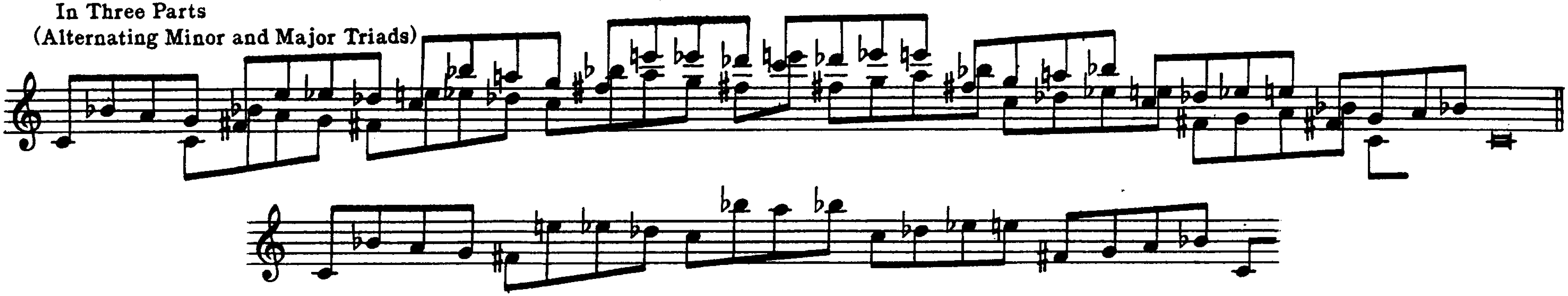


## Bitonal Palindromic Canon: F Major and B Major

Scale №12 (In Six Parts)

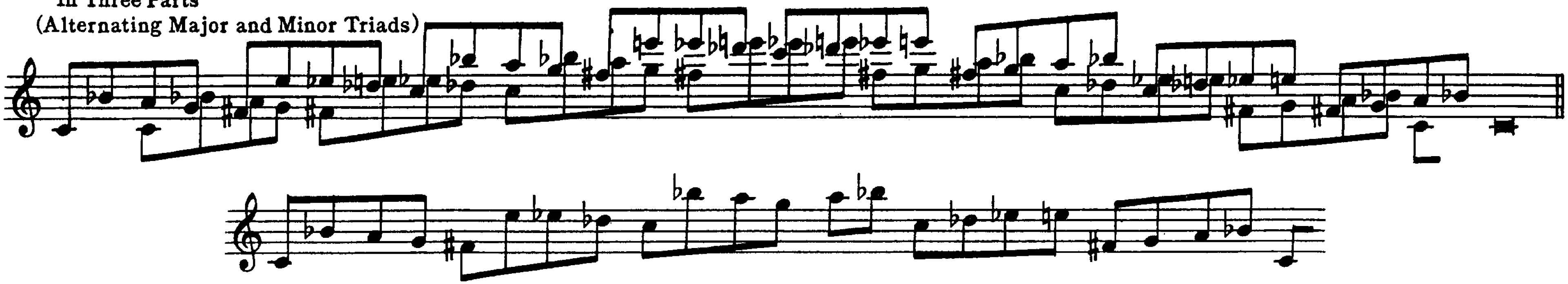


# Two Palindromic Canons on Pattern 72

In Three Parts
(Alternating Minor and Major Triads)

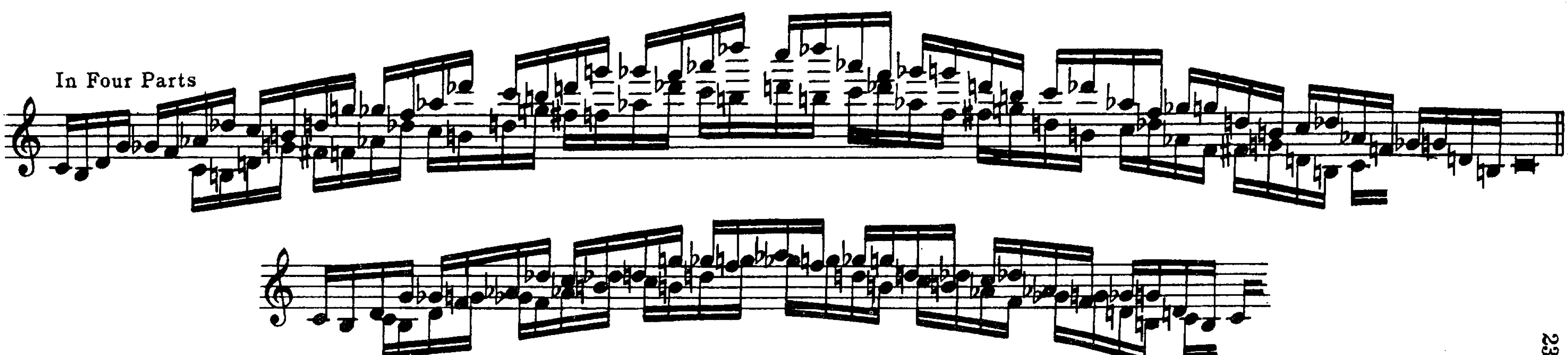


In Three Parts
(Alternating Major and Minor Triads)

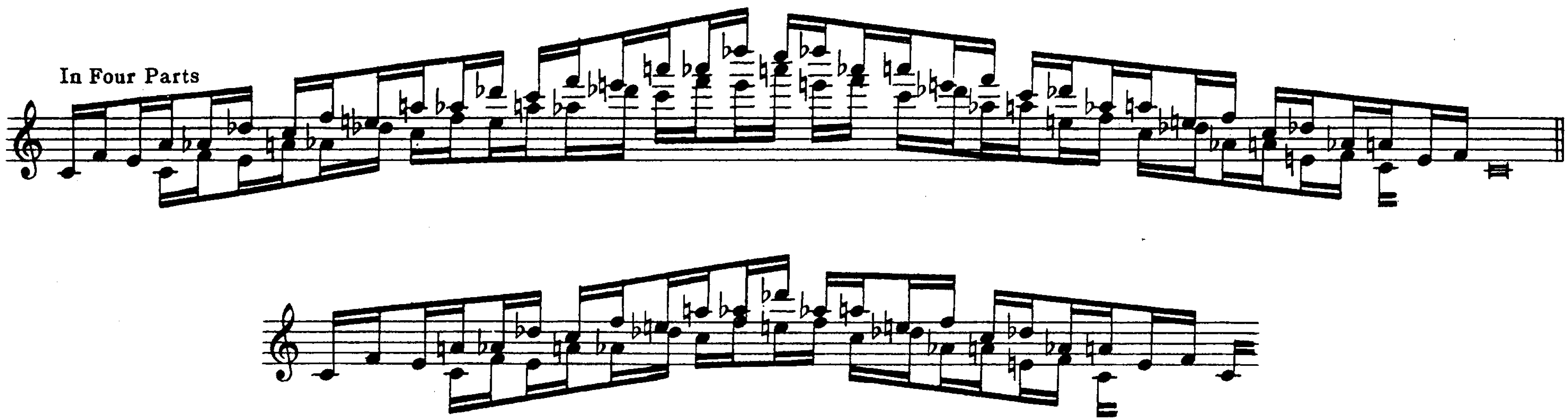


# Palindromic Canon on Pattern 141

In Four Parts

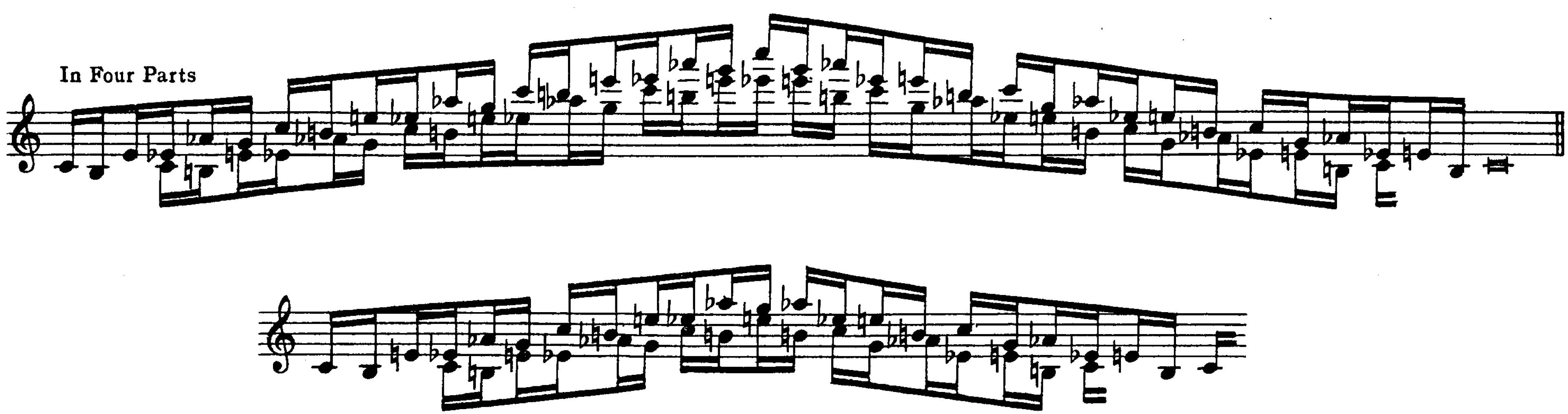


## Palindromic Canon on Pattern 186
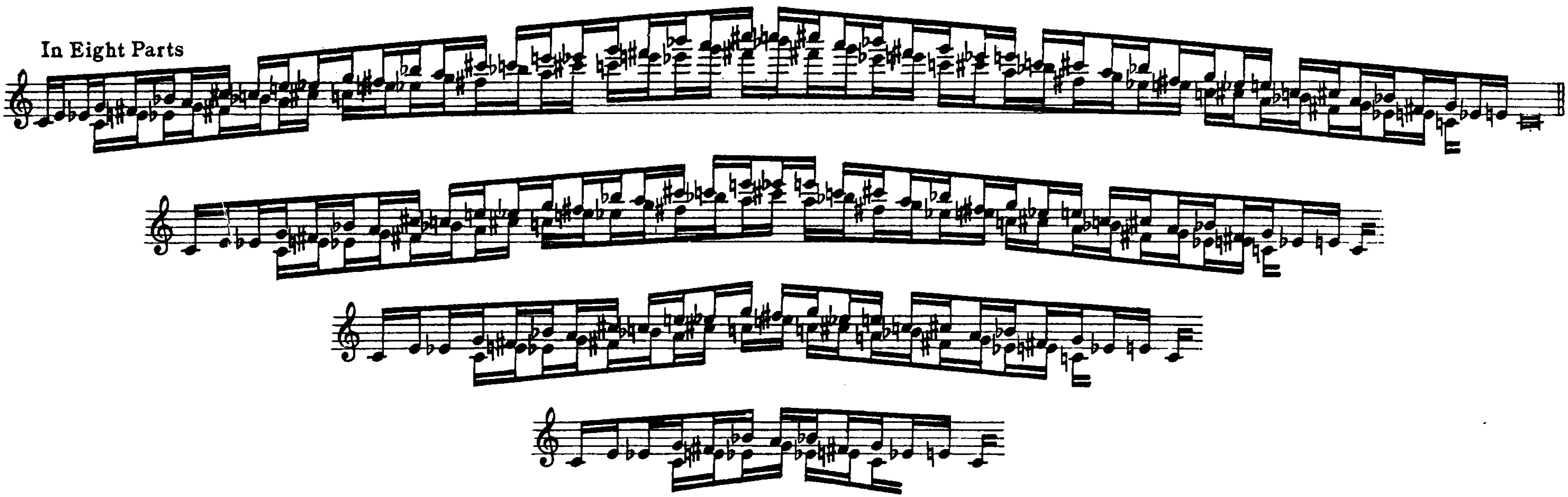



## Palindromic Canon on Pattern 231

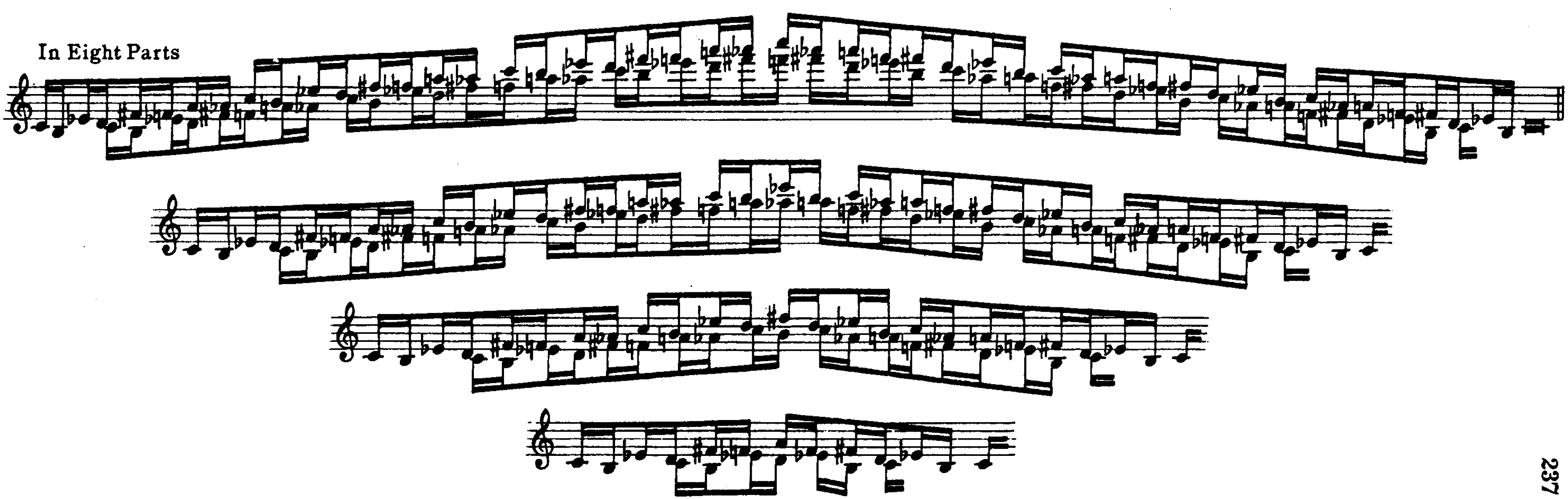
(Theme from Schoenberg: *Ode to Napoleon*)
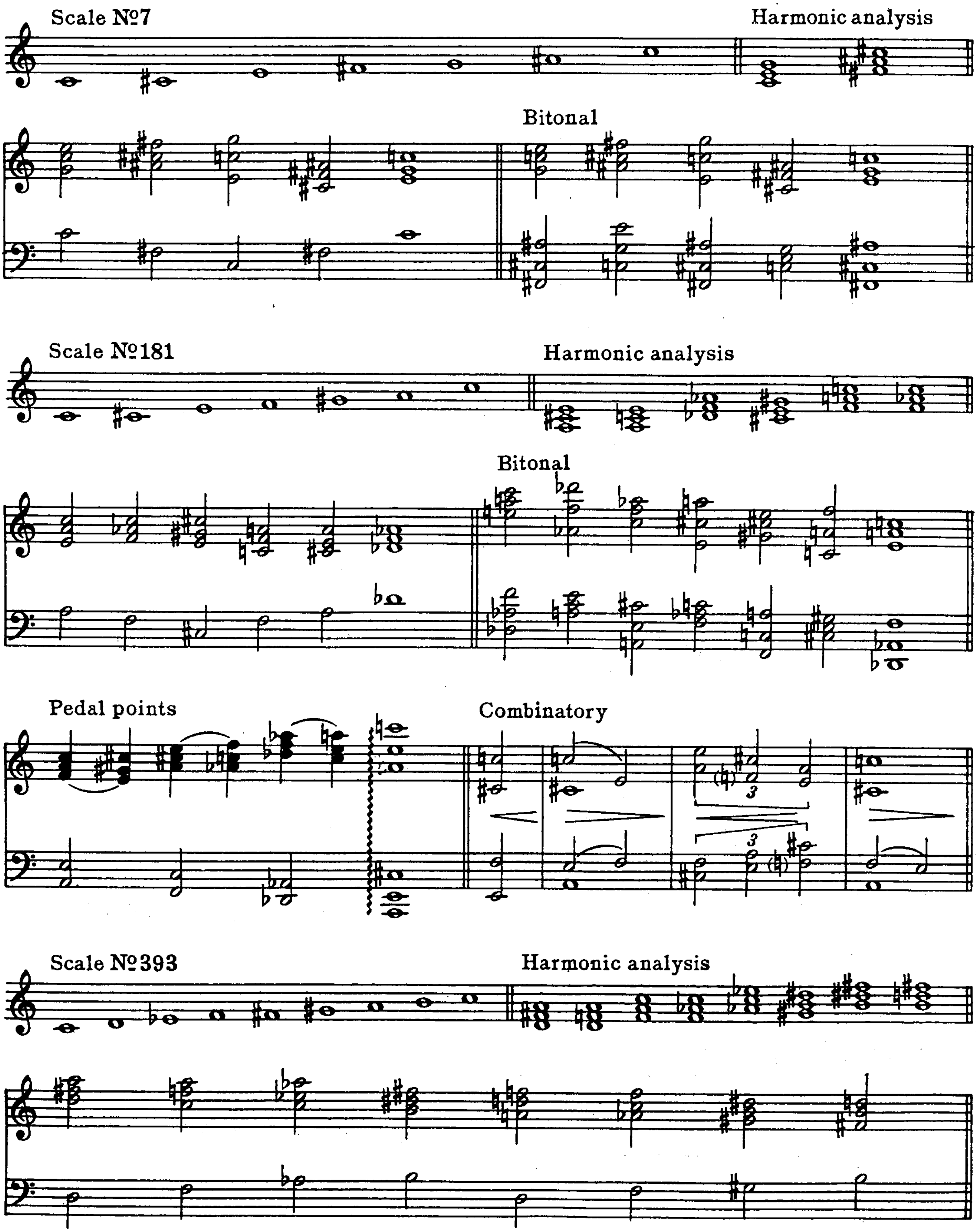


## Palindromic Canon on Pattern 394



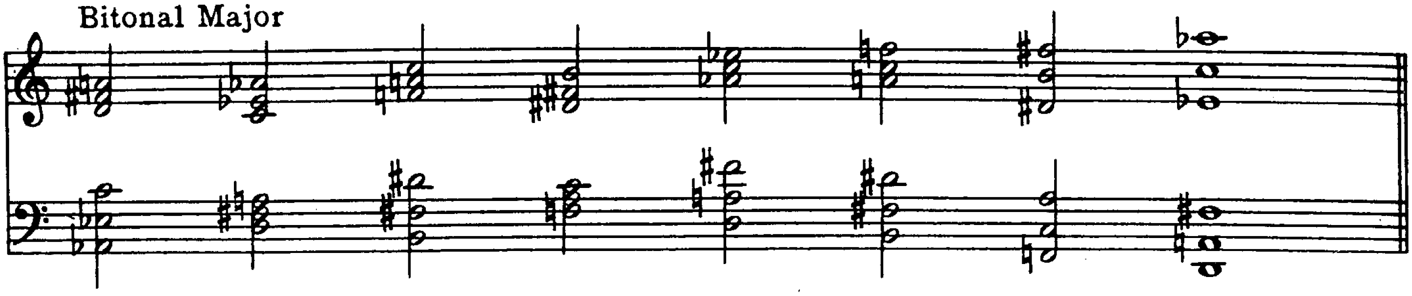

## Palindromic Canon on Pattern 447



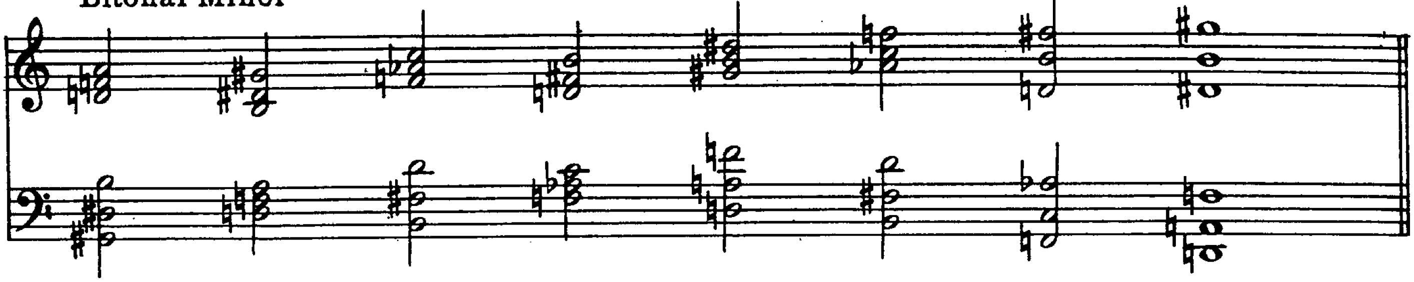
# Autochordal Harmonization
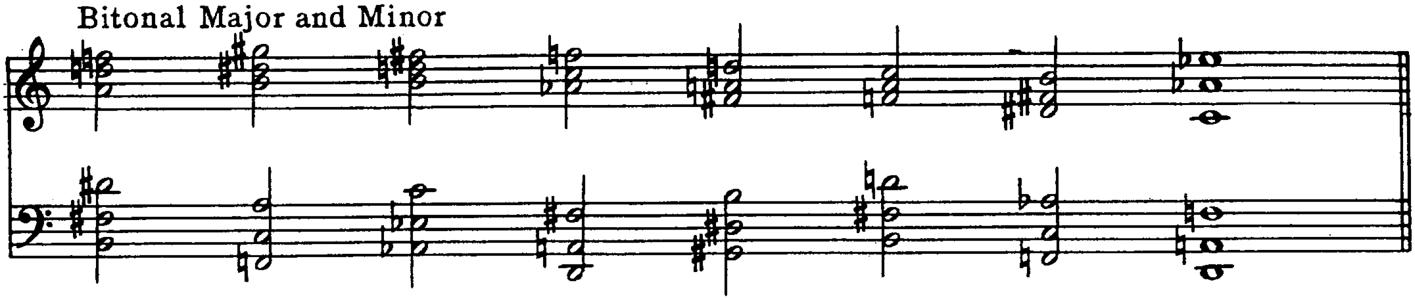


Bitonal Major



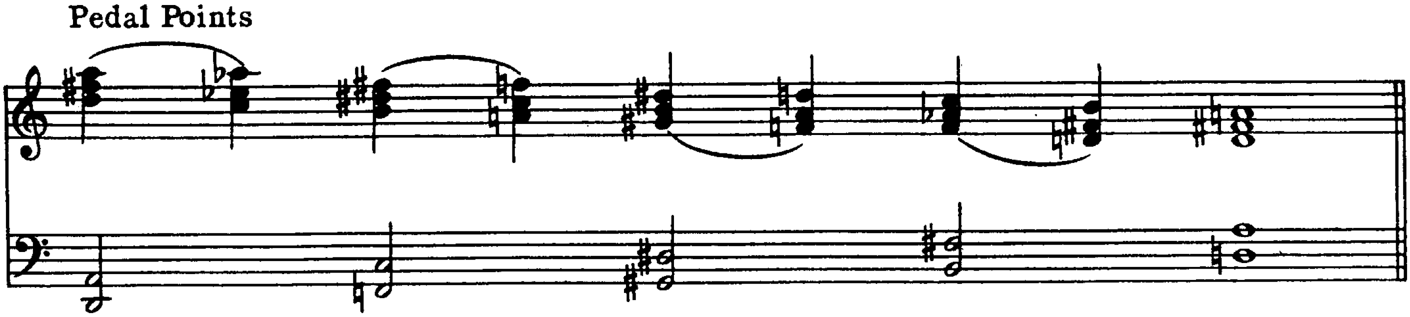
Bitonal Minor
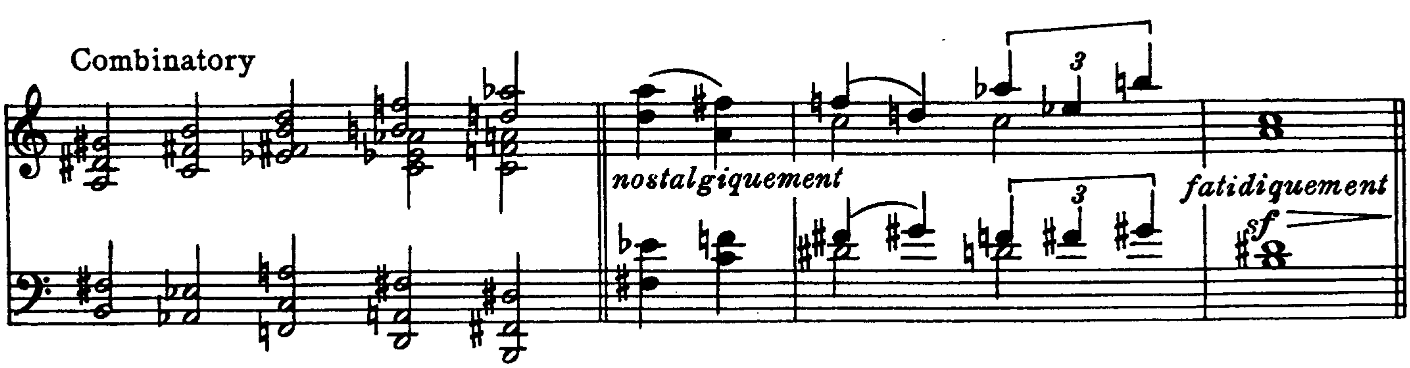


Bitonal Major and Minor



Pedal Points

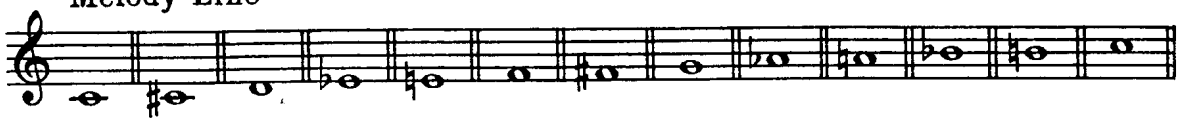


Combinatory
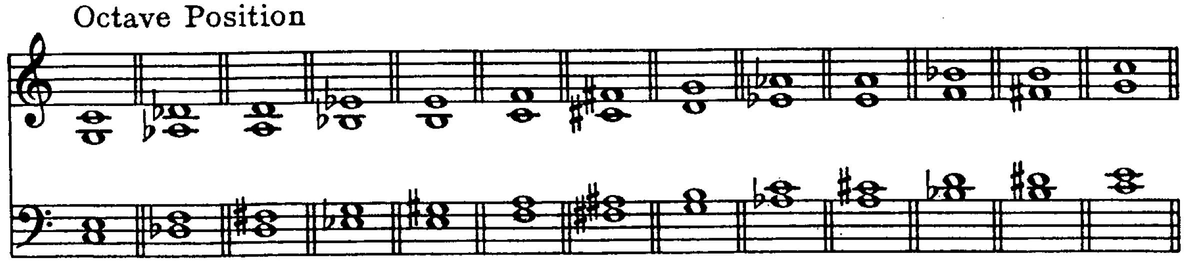


# Harmonization in Major Triads
## by Alternation of Octave, Tertian and Quintan Positions
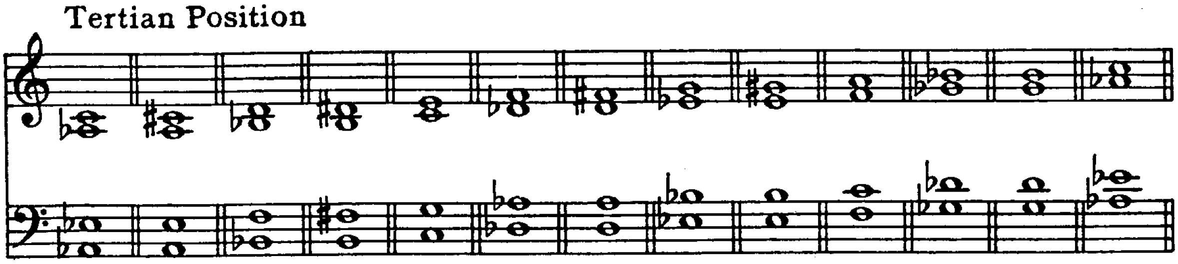
Melody Line
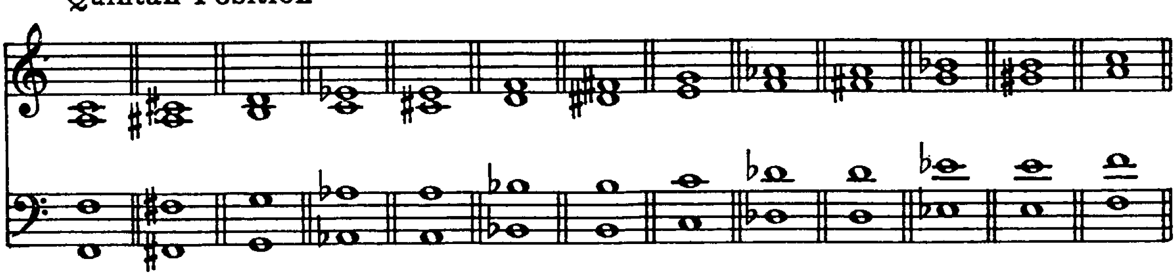


Octave Position



Tertian Position

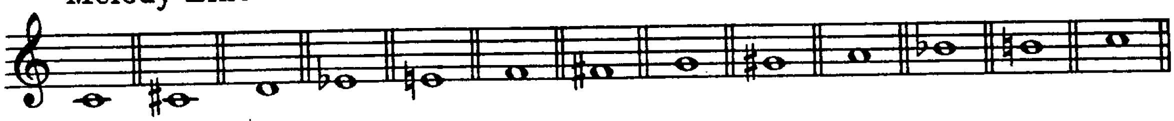


Quintan Position

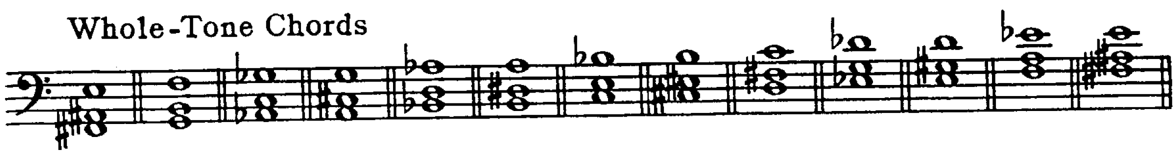


# Harmonization in Seventh-Chords, Ninth-Chords and Whole-Tone Chords
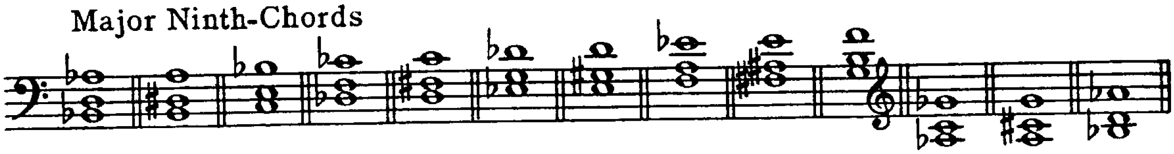
Melody Line
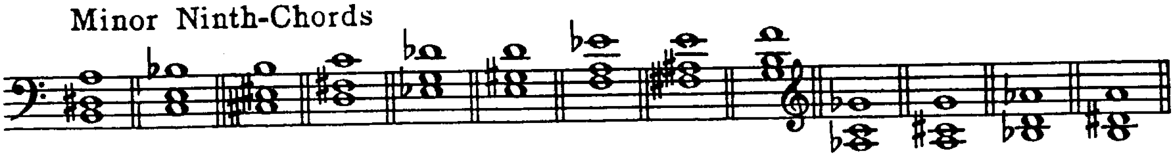


Whole-Tone Chords
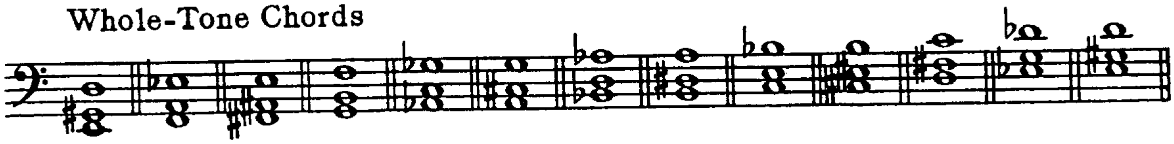


Major Ninth-Chords



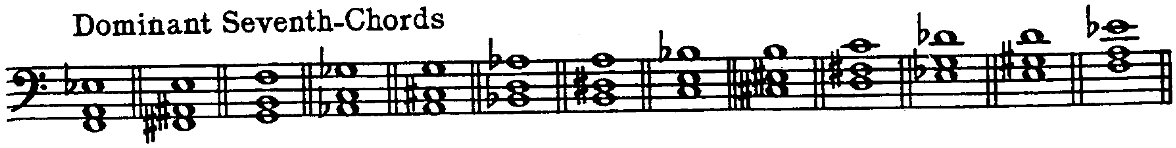
Minor Ninth-Chords
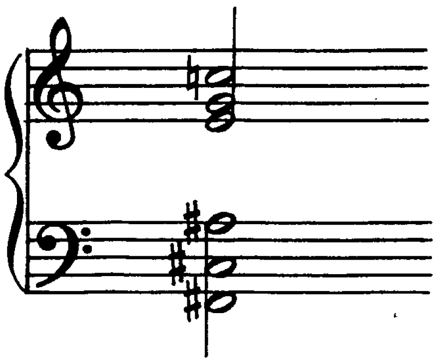


Whole-Tone Chords



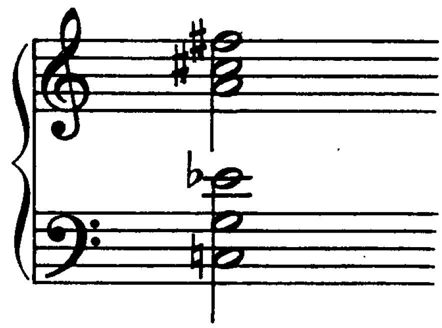
Dominant Seventh-Chords
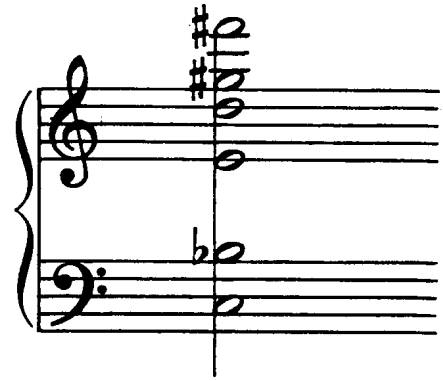


# Synopsis of Chords
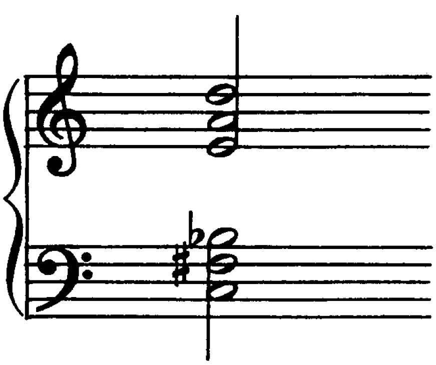


Major
Bitonal Chord



Minor
Bitonal Chord
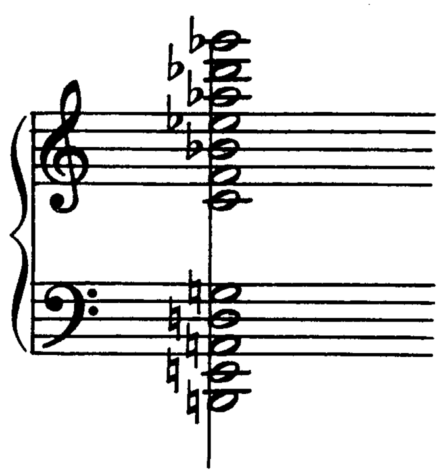


Whole-Tone
Chord
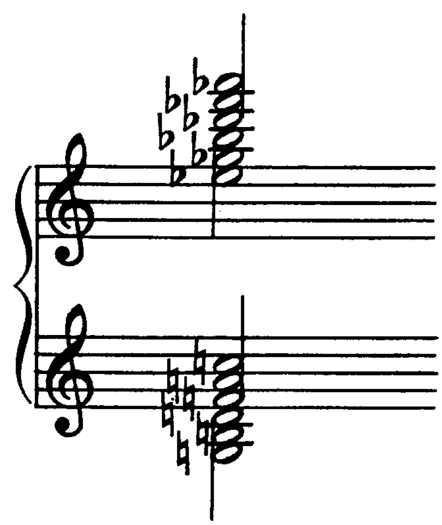


Prometheus
Chord

(Scriabin)
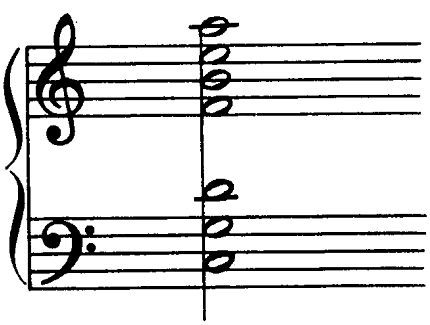


Quartal
Chord

Containing All Twelve Chromatic Tones Arranged in Fourths



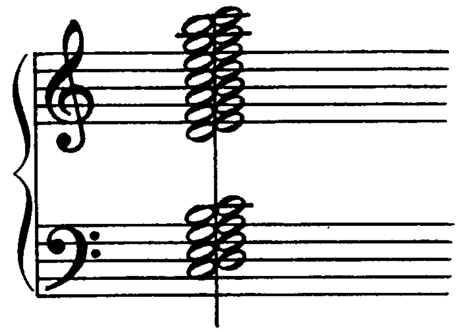
Chord
of the Minor 23rd

Containing All Twelve Chromatic Tones and Four Mutually Exclusive Triads

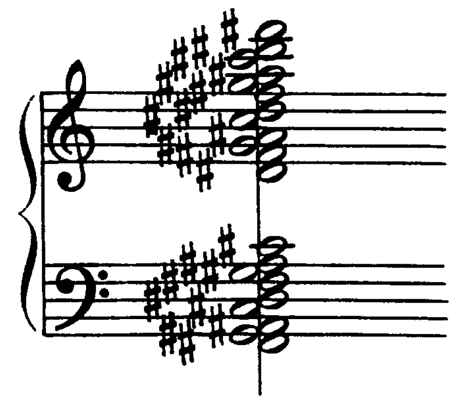


Pandiatonic Chord
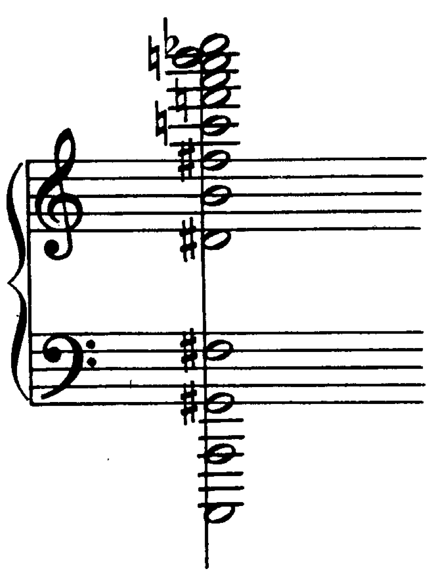
Containing All Seven Diatonic Tones



Pandiatonic Tone-Cluster

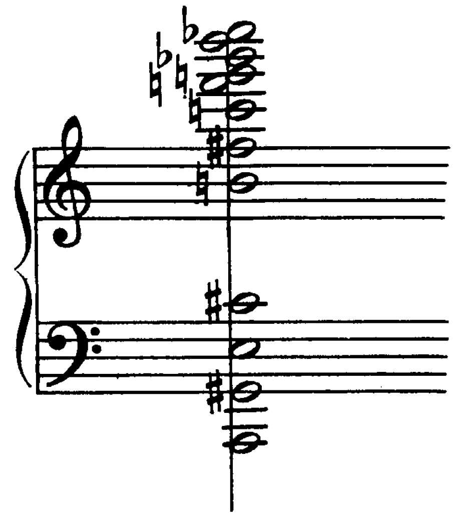


Pentatonic Tone-Cluster



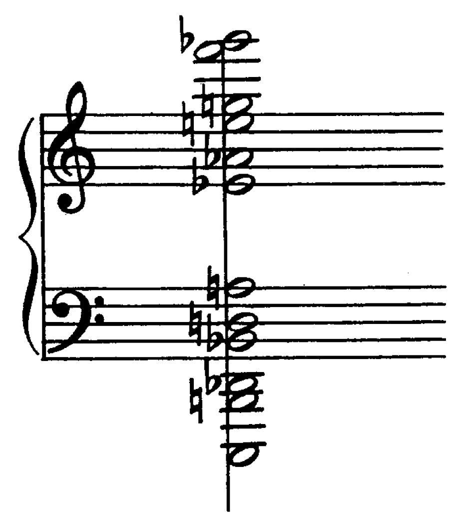
Pyramid Chord

Containing All Twelve Intervals From an Octave to a Semitone



Mother Chord

Containing All Twelve Chromatic Tones and Eleven Different Intervals
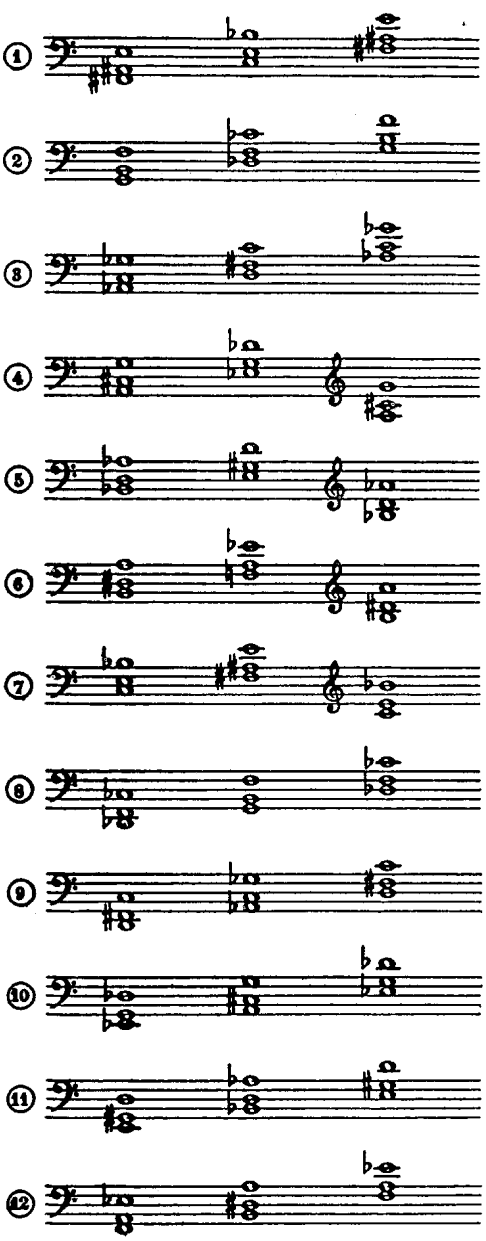


Grandmother Chord

Containing All Twelve Chromatic Tones and Eleven Symmetrically Invertible Intervals

# Master Chords

## Tritone Progression

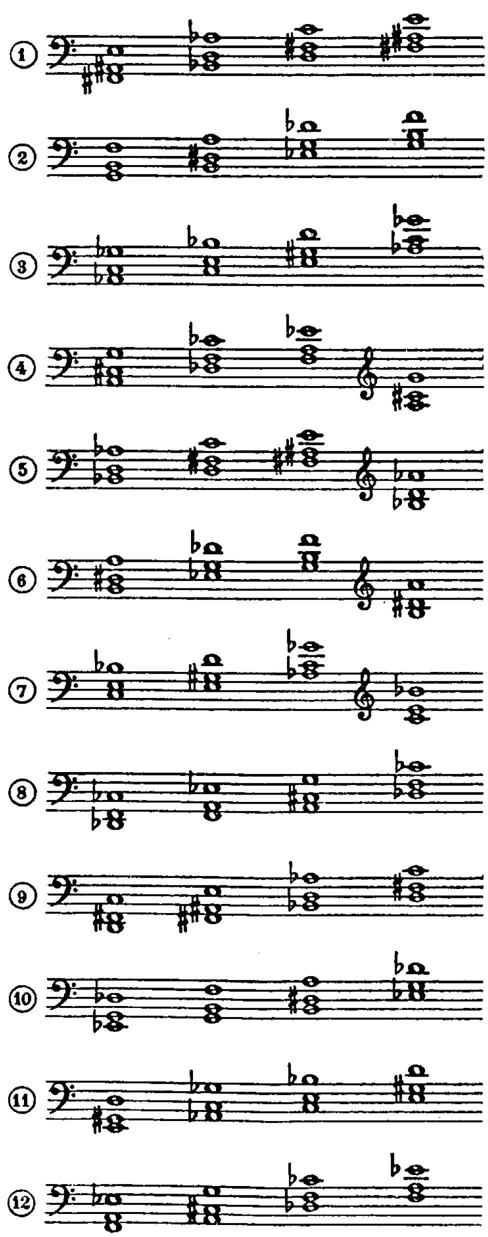
**Scales and Patterns 1-180**



# Master Chords

## Ditone Progression

**Scales and Patterns 181-391**



# Master Chords

## Sesquitone Progression

**Scales and Patterns 392-568**

